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THE CALISAYA BARKS OF EASTERN BOLIVIA.

By J. E. Howard, Esq., F.L.S., etc.

(Plate LXXXVII.)

This plate represents specimens brought by Don Pedro Rada of the (till recently) quite undisturbed Cinchonæ growing on the slopes of the great chain of the Andes, which descend towards the rivers Bopi and Beni, and border on the little-explored but richly-wooded lowlands of the interior of the vast continent of South America. Señor Rada has departed for his native country, with the intention of again repeating his importations of bark, and promises to bring specimens of the fruit and flowers of the sorts above mentioned. Nevertheless, I have thought it best at once to record the information obtained, since much delay must attend on the fulfilment of this gentleman's promise.

The specimens are of the variety called *la morada*, and of that known to him as *la negrilla*, and do not include two other forms, *la naranjada* and *la verde.*

The two first kinds are those which Señor Rada held in most esteem, having been led rather to under-estimate the *naranjada*, if not also the *verde.* The drawing of the *morada* is from one of his specimens, and the colouring is given in accordance with living plants which were at once fixed upon by Señor R. as being those of Bolivia. These

plants represent apparently the *Ichu Calisaya*, or var. *Josephiana*, also the *morada*, the *zamba-morada*, the *naranjada*, the *verde*, and two or three other forms.

The bark of the *negrilla* is apparently the same of which I received specimens from Dr. Weddell, collected in his *second* journey in Bolivia, and called *Calisaya zamba*, *negra*, or *macha* (see Histoire, etc., p. 35). (The *negrilla* of commerce is quite another thing.) Of this *black* sort, Mr. Fitch has given simply the outline of a leaf in the background. It must be considered a variety of *Cinchona Calisaya*, but it is a very marked form, approaching more nearly to the normal character of this plant than it does to the *C. Boliviana.*

The *morada* seems to vary so much more from the *C. Calisaya*, that I hesitate to ascribe it to this source, only that the bark is imported and passes unquestioned as that of genuine *Calisaya.* If the botanical information given to me with the above specimens by Señor Rada be confirmed by subsequent investigations, it seems that the evident analogy of the plant is with the *C. purpurea* of Pavon (exclus. *C. pubescens*), as this is represented in the 'Flora Peruviana' (R. and P.), in Heyne's 'Arzneigewächse,' and in my 'Quinologia.' This is better seen in the strictly *morada* than in the nearly allied *zamba-morada*, which is, I think, the sort here described and delineated.

If this supposed resemblance to the *C. purpurea* should be found correct, it will harmonize with information given under the head *C. purpurea* in the 'Quinologia' respecting specimens gathered by the German botanist Lechler, and representing (as he tells us) the "*Cascarilla morada* et *Zamba morada* incolarum."

Lechler's specimens were gathered near the river of San Govan (probably San Juan). I think them allied to those here described, but not *exactly* identical, since I believe that every marked district of the Andes has its own Cinchonæ, and that those of Carabaya (in which it is probable San Govan is included) are not in all things exactly similar to those of Eastern Bolivia.

The colour of the flowers, according to Señor Rada, is purple in *la morada*, white in *la verde*, and the height of the trees great, not less in these virgin forests than from 40 to 50 varas (*i.e.* from 120 to 150 feet), some falling short of this altitude, but others exceeding it. The great size of the trees must be concluded from that of the flat bark from the trunk which he has brought into this market. The

most remarkable circumstance is that the barks of trees so varying in leaf and flower as are doubtless the *negrilla*, the *morada*, and the *naranjada*, should so far resemble each other as to pass under the general name of *Calisaya*. But so it is;* and if the *morada* be at all allied to the *C. purpurea*, it must be remembered that, in the essential requisite of the bark-clothing, it differs widely from its Peruvian namesake. The *naranjada* and *verde* (if, indeed, plants in my possession turn out to be of these kinds), differ so widely in the leaves, that I shall not venture on their description here, except to remark that the *naranjada* has scrobicules not only at the axils of the veins, but also at their junction with the smaller veins, as in the *Olea scrobiculata*.

To what possible cause, since *imitation* is excluded, can we ascribe that harmony which, as Dr. Seemann has remarked, seems to prevail even in these obscure departments of vegetable physiology? The influences of soil and climate would surely tell as soon upon the leaves as upon the bark, yet these *barks* assimilate, whilst the *leaves* do not.

NOTICE OF A FOSSIL LYCOPODIACEOUS FRUIT.

By M. Brongniart.

(*Translated from the* '*Comptes Rendus des Séances de l'Académie des Sciences*,' *vol.* lxvii.; *Séance Août* 17, 1868.)

The study of the vegetable fossils of the palæozoic rocks presents a peculiar interest on account of their singular forms, which generally separate them in a very remarkable manner from the plants now living on the earth.

With the exception of the Ferns, which have a similar form throughout all time, the other plants of the coal period differ so greatly from those of the later periods, as well as those now living, that the most careful examination has failed to refer them to families of recent plants.

However, since I began my researches, I have determined the affinities of several arborescent plants of this period to *Equisetaceæ* and *Lycopodiaceæ*.

* Compare Guibourt, 'Drogues Simples,' 1850, t. iii. pp. 135, 136.

In respect of the latter family, I united to the large stems and branches which form the genus *Lepidodendron* certain spikes, or cones of fructification, which appeared to me to be the cones of these gigantic *Lycopodiaceæ*, and which I designated by the name *Lepidostrobus*.

Since then, these relations have been completely confirmed by the observations of Dr. Joseph Hooker on several specimens of *Lepidostrobus*,* enclosed in nodules of carbonate of iron, from the English coal-field, the internal structure of which had been so well preserved as to exhibit, much better than I had seen, the form of the sporangia borne on the scales of these cones, and the nature of the spores contained in them.

Another specimen, remarkably well preserved, the origin of which was unknown, had been previously described by our illustrious associate R. Brown, under the name of *Triplosporites*. His profound study of this specimen in 1847, and the additional observations made in his memoir in 1851,† after the examination of a beautiful specimen which I showed him in 1849, convinced him of its intimate relations to *Lepidostrobus*, from which he hesitated to consider it as generically distinct.

But the specimen described by Robert Brown,‡ as well as that of the Museum at Strasbourg, half of which had been given to the Museum at Paris, and which I showed him, presents only short portions of those cones; that described by Robert Brown belongs evidently to the summit of a cone; that which I had studied appeared to proceed from its base, but the perfect specimen which is the subject of this notice shows that it rather belonged to the middle portion of one of these spikes of fructification. Indeed, the lower portion of these cones presents very remarkable differences of organization, which must materially modify the characters ascribed to these fossils, and appear to indicate greater differences between them and *Lepidostrobus* than one would have supposed, if the organization of these latter fruits has been fully understood from the specimens described by Dr. Joseph Hooker.

* 'Memoirs of the Geological Survey of Great Britain,' vol. ii. p. 440.

† "Some Account of *Triplosporites*, an Undescribed Fossil Fruit." Transactions of the Linnean Society, vol. xx. p. 469, 1851. (Read to the Society June 15th, 1847.)

‡ This specimen was obtained from the collection of Baron Roger, and a transverse section preserved in the collection of the Marquis de Dré now forms part of the collection of the Museum of the Jardin des Plantes.

The numerous spikes of fructification—many of them, however, very imperfectly preserved—examined by this excellent observer are often very small portions of the cones; some of them, however, seem to have been preserved in full, and there is no indication of difference of structure between the base and summit. All the scales bear sporangia of the same form, which appear to enclose bodies of the same nature; this is, at least, what the figures and descriptions published by the learned English botanist indicate.

These characters seem, then, to place *Lepidostrobus* among true *Lycopodia,* the sporangia of which are all alike, and enclose similar spores.

The family of *Lycopodiaceæ* contains two other genera very different in this respect, *Selaginella* and *Isoëtes,* which, on the same stem or in the same spike,—that is to say, on the same axis,—have two kinds of sporangia, the one containing very small spores destined to produce antherozoïds, and to become fecundating organs; the other much larger spores, which germinate after being fecundated. These two organs have been designated by the names of *microspores* and *macrospores.*

There is nothing in the specimens described by R. Brown, or by Dr. J. Hooker, which indicates this double nature of the sporangia and spores; but a very perfect and on the whole well-preserved specimen of a spike, identical in its upper part with the *Triplosporites* of R. Brown, throws a new light on this subject, and shows a modification in these points analogous to what we observe in living *Lycopodiaceæ.*

This remarkable specimen was found in the drift at the entrance of the valley of Volpe, in Haute-Garonne, by M. Dabadie, apothecary; it was given to me by M. Lartet, to whom M. Dabadie had entrusted it, and the discoverer of this interesting specimen has been good enough to allow me to make a longitudinal section of it, and to keep the half of it for the Museum.

This specimen, of which a cast was carefully taken before being cut, is completely silicified; the organization of the different parts is well preserved in many points; but the anfractuosities and the crystallized parts do not allow an equally complete examination throughout.

It is a cone or cylindrical strobilus, 4 inches $8\frac{1}{2}$ lines long, and 2 inches $1\frac{3}{4}$ lines broad, showing on the exterior the summits of the scales of which it is composed; these form twenty-seven perfectly

regular longitudinal ranges, which are disposed in a very elliptical helix, whose generating spire would be expressed by the fraction $\frac{2}{27}$,—an arrangement approaching that seen in several living *Lycopodiaceæ*.*

The scales or bracts which form the spike are borne perpendicularly on the axis, and are even a little reflected; as they have exactly the structure so well described by R. Brown in his *Triplosporites*, it is unnecessary for me to repeat it. As in his specimen, they take an erect direction towards their apex, and terminate at the surface of the fossil in a hexagonal disk, which should, as in *Lepidostrobus*, be prolonged into a foliaceous appendix, but this has been destroyed.

On the narrow pedicels of these scales are inserted oblong sporangia, rounded at their extremities, as in *Triplosporites*; those which occupy the summit and middle portion of the spike are filled with an innumerable quantity of little spores, formed of three or sometimes of four spherical united cellules, which in some cases appear to separate into simple globular spores.

On the lower portion of the spike we find sporangia similar in form and in their mode of attachment to the preceding, but which are obviously distinguished from them by the spores which they contain being simple, spherical, and of a considerable size, their diameter being ten or twelve times greater than that of the smaller spores. They are very distinct to the naked eye, their diameter being three-tenths of a line, and enable one at once to detect the sporangia containing the microspores.

These larger and perfectly spherical spores have a thick, smooth covering; they generally contain scattered globular granules, the nature of which it is difficult to ascertain, but which seem to indicate an immature state; some, filled with an opaque matter, appear more advanced in their development.

This spike thus presents, as in the Lycopodiaceous genera *Selaginella* and *Isoëtes*, sporangia of two kinds, the one towards the summit containing microspores,—that is to say, antheridia; the others, placed towards the base of the spike, containing macrospores, or germinating spores.

The form and mode of attachment of these sporangia, their large size, the great number of microspores they contain, the absence of any

* I have represented this arrangement of the leaves of *Lycopodiaceæ* in the 'Histoire des Végétaux Fossiles,' vol. ii. plate ii.

trace of a line of regular dehiscence, are points in which they resemble specially the sporangia of *Isoëtes;* but in this genus the sporangia are situated at the very base of the leaves, which are borne on a very short and bulbiform stem.

In the fossils, on the contrary, the sporangia are borne on a kind of bracts, or squamæform leaves united in a spike, which, like those of *Selaginella*, probably terminated the branches.

There is, then, here a singular combination of characters: sporangia analogous to those of *Isoëtes*, arranged in a spike similar to that of *Lycopodium*, but much larger.

The great size of their organs is, indeed, one of the striking characteristics of these spikes. It agrees with the arborescent habit of *Lepidodendron*, compared with that of the living *Lycopodiaceæ*, but it is not on this account the less remarkable, as the organs of reproduction do not generally follow the growth of the vegetative organs; the largest tree-ferns have not greater sporangia than the smallest species; and, in the same way, the flowers of our large trees are often smaller than those of the most humble herbaceous plants.

In these palæozoic plants the growth has been simultaneous in the two systems of organs.

Thus, *Lepidodendron*, a genus of arborescent *Lycopodiaceæ*, had spikes of fructification agreeing in their size with the cones of Firs and Cedars, containing very large sporangia, rather than with those of *Isoëtes*, which they resemble in form and structure.

And the question remains to be considered, have the fruits of true *Lepidodendron*, i.e. *Lepidostrobus*, which have been described by Dr. J. D. Hooker, only one kind of spores, or has the imperfect state of the specimens prevented the true nature of the spores contained in the lower sporangia of the spike from being ascertained? The form of the spores of *Lepidostrobus* differs so much from those of the microspores of *Triplosporites* as to induce me to consider these plants as belonging to different genera, and that the genus *Triplosporites* of Robert Brown ought to be retained.

The three known specimens of this fossil do not enable us to establish its true geological position. The origin of that described by R. Brown and of the one in the Strasbourg Museum is entirely unknown. That which I have just described was found in the drift in a Pyrenean valley far from the formation in which it was originally preserved;

there can be no doubt, considering the group of plants to which they are related, that they have been obtained from deposits contemporary with the Coal or Red Sandstone formations.

Robert Brown, in his memoir, has not given any specific name to the plant he has described; but the establishment of its generic value, and the probability that other forms of the same genus will be found, induce me to perpetuate the memory of his important observations by naming this species *Triplosporites Brownii.*

I ought, in conclusion, to remark, that this very perfect specimen which I have described probably represents a spike not fully developed. Two things seem to indicate this: *first*, the microspores are, in almost all the sporangia that contain them, immersed in an opaque granular substance in which they show themselves by their transparency, and which appears like the cellular plasma that surrounds these organs before maturity; *second*, the vessels which form the very distinct bundles in the axis of the cone, show only transverse striæ or very indistinct rings, and not the decided lines of adult scalaridiform vessels.

This immature condition has, perhaps, favoured the beautiful preservation of these fossils; but it is possible, and even probable, that the microspores and macrospores, when completely developed, would present some differences, which need not be considered as proceeding from a really distinct organization. Some of the spores forming the triple microspore seem already disposed to isolate themselves, and might, perhaps, take the trigonal form indicated by Dr. Hooker in the spores of *Lepidostrobus*. Some of the macrospores seem also to present in the interior a more complicated structure, which may indicate a tendency towards the appearance on the trigonal summit of the macrospores of *Isoëtes.*

New specimens, even simple fragments, but in a different stage of development, may turn up to complete our knowledge; but now the existence of gigantic *Lycopodiaceæ*, more completely correlated with living forms of the Order, is indubitably established.

NOTES ON LEMNACEÆ AND ON THE DISCOVERY OF THE RAPHIDIAN CHARACTER IN SYSTEMATIC BOTANY.

By George Gulliver, F.R.S.

Although our knowledge of the comparative structure of the Duckweeds has been much advanced during the last few years, we do not find a corresponding progress in the descriptions and figures of these plants in our books of systematic botany. The forthcoming plate of *Wolffia*, under the care of the worthy editor of the third edition of 'English Botany,' will, no doubt, be at least on a level with the present state of science. As yet there have been added in that work only the flowers of *Lemna polyrrhiza* to the old plates of the four species of this genus; while those important details of structure which are now, through the memoirs by Hoffmann and others, well known as affording valuable diagnostic characters, are not figured, and the large vacant space of each plate is left waste and useless. And hence, for a satisfactory exposition of our own familiar and useful Duckweeds, we are still obliged to consult, besides our great national Flora, the engravings and descriptions scattered through various foreign and native periodical works, most of which have been so carefully specified in Dr. Trimen's valuable paper on *Wolffia*, published in a former volume of this Journal, as to relieve me of the task of citations.

In short, a fair account of the British *Lemnaceæ* is now wanting in our books, and the present notes are intended as a small contribution towards this desirable object, which involves a few little additions to, and a revision of, some points respecting these plants and raphides in the sixty-fourth number of the third edition of 'English Botany.'

Use of Duckweeds.—As the popular and practical English mind is wont to raise this question at the threshold, 'English Botany' is ready there with its answer:—"Although pretty enough to excite general interest, we have nothing to record of the uses of the species of *Lemna*." Too severe a sentence, surely, on even these abject and despised things, and withal in sad disregard of that plea for the Duckweeds, long since advanced in the case of *L. minor*, which proved the utility of one or other of these apparently mean and worthless plants in the economy of nature. For certain it is that the most common and abundant Duckweed may be found, and recognized by its cell-characters, in the stomachs of young

Waterfowl and Water-Voles; and I have elsewhere described the bountiful provision of its starch and calcareous raphides for a suitable adjunct to the food of growing animals. Indeed, to me, a Duckweed-patch always appears delightful from its very utility, both in this way and as a procreant cradle of those beautiful and mysterious organisms which live and move and have their being on the boundaries of the two great kingdoms of organized nature. In short, a Duckweed-patch is not only the home of many happy families, full of life and enjoyment, but it provides either nutriment or shelter, in one shape or other, to many creations, from Mammalia down to the Protozoa and Protophyta; and is truly a prolific and provident field, with a little world of its own, eminently valuable and useful, although its complete history yet remains unwritten.

Lemna trisulca.—The late Dr. Lindley and other eminent botanists denied that there is an epidermis on plants which live habitually under water. Whether this *Lemna* be always thus totally immersed might admit of question, though it is fairly described, in 'English Botany,' as having its "fronds submerged." In the same great work we find only this plant under *Staurogeton*, a section of which one of the characters there given is "epidermis absent;" and this, no doubt, according to the common view, which nevertheless needs further inquiry.

I have often found an epidermis on parts of plants which are always covered by water; so, it would seem, have other botanists, for Schnetzler, in his memoir on *Utriculariæ*, remarks that "in entirely submerged aquatic plants the leaves are destitute of stomata, and absorption and exhalation take place through the whole surface of the epiblema." But now we are only concerned with *Lemnaceæ*, on both sides of the fronds of which an epidermis is commonly present, as may be well seen in *L. minor*. And *L. trisulca* is thus invested with a distinct but very delicate and transparent epidermis, which resembles the same tissue on the other species of the genus, but wanting the stomata which belong to their upper surface.* The margins of the

* Whilst these sheets are in the press, our attention has been directed to Dr. Hegelmaier's recently-published monograph 'Die Lemnaceen,' which contains full descriptions and numerous figures of the structure of all the species of the Order *Lemnaceæ*. On tab. vi. fig. 8, the epidermis of an aërial frond (*luftspross*) of *L. trisulca* is figured with a stomate. The term epidermis is, by some botanists, restricted to its perfect condition when provided with stomata, the thin membrane covering subterranean and subaqueous organs being termed epiblema or epithelium.—Ed. Journ. of Bot.

epidermal cells of *L. trisulca* are wavy or sinuous, while the margins of the underlying parenchymatous cells are straight or smooth; so that the epidermis so far answers to a 'colpenchyma,' and the subjacent tissue to a 'sphærenchyma.' Thus *L. trisulca* agrees with those other species of the genus, which are well known to differ, as judiciously described in 'English Botany,' in this form of epidermal cells, from *Wolffia*.

The epidermis of *L. trisulca* is so thin and pellucid as easily to escape detection, and requires for a satisfactory examination a magnifying power of not less than two hundred diameters. If a suitable fragment of the plant be placed under an achromatic object-glass of one-eighth of an inch focal length, so as to show the parenchymatous cells with the clearest definition, and the focus be then slightly lengthened, the wavy edges of the epidermal cells will be distinctly seen covering the subjacent tissue. At least, I have never failed to find the epidermis of *L. trisulca* by this kind of procedure, and have often succeeded, by maceration and a little manipulation with needles, in separating the epidermal cells from their underlying connection. But as the question of the presence or absence of the epidermis is important, both in an anatomical and physiological point of view, I have submitted the plant to examination by an independent and competent authority, and, by the kindness of Mr. Carruthers, am enabled to give his report, as follows:—

"*British Museum, Nov. 30th*, 1868.

"I examined the specimens of *L. trisulca*, and saw distinctly the epidermal cells which you figure, but I could not detect any stomata, and I see you do not figure any. Does there exist in aquatic plants a delicate epidermis destitute of stomata? And is the carbonic acid gas obtained from the water in which it is dissolved by endosmose through the epidermis, while in the air the carbonic acid gas has direct access to the parenchyma of the leaf by the stomata?"

The bundles of raphides in *L. trisulca* are so evident, especially towards the circumference of the frond, that they may be recognized with the aid of a pocket lens. At first sight, under a higher magnifying power, they seem to be within a distinct cell of their own; but a nicer examination in the mature frond commonly fails to detect any other boundary to the space which contains them than the surfaces of

the surrounding parenchymatous and epidermal cells; and so, too, of the raphides of the other *Lemnæ*. The raphides of *L. trisulca* were used in "Class-Botany" and histological demonstrations by Professor J. H. Balfour and Mr. George Lawson some years before my description of these objects in the system of raphidian characters.

The root-sheaths of this plant are curved and sharp-pointed.

Lemna polyrrhiza.—In this species the raphides are scanty. The root-sheath is sharp at the tip.

Lemna gibba.—Raphides scanty. Root-sheath with a bluntish point.

Lemna minor.—Bundles of raphides abundant, especially towards the edges of the frond. Starch-granules very plentiful. Root-sheath with a blunt tip.

Wolffia arrhiza.—Destitute of raphides, by which character simply this plant may be easily known from *Lemna minor*. Starch-granules plentiful, particularly in the escaping and escaped bulbils; stomata very plain on these young bulbils.

Fig. 1.

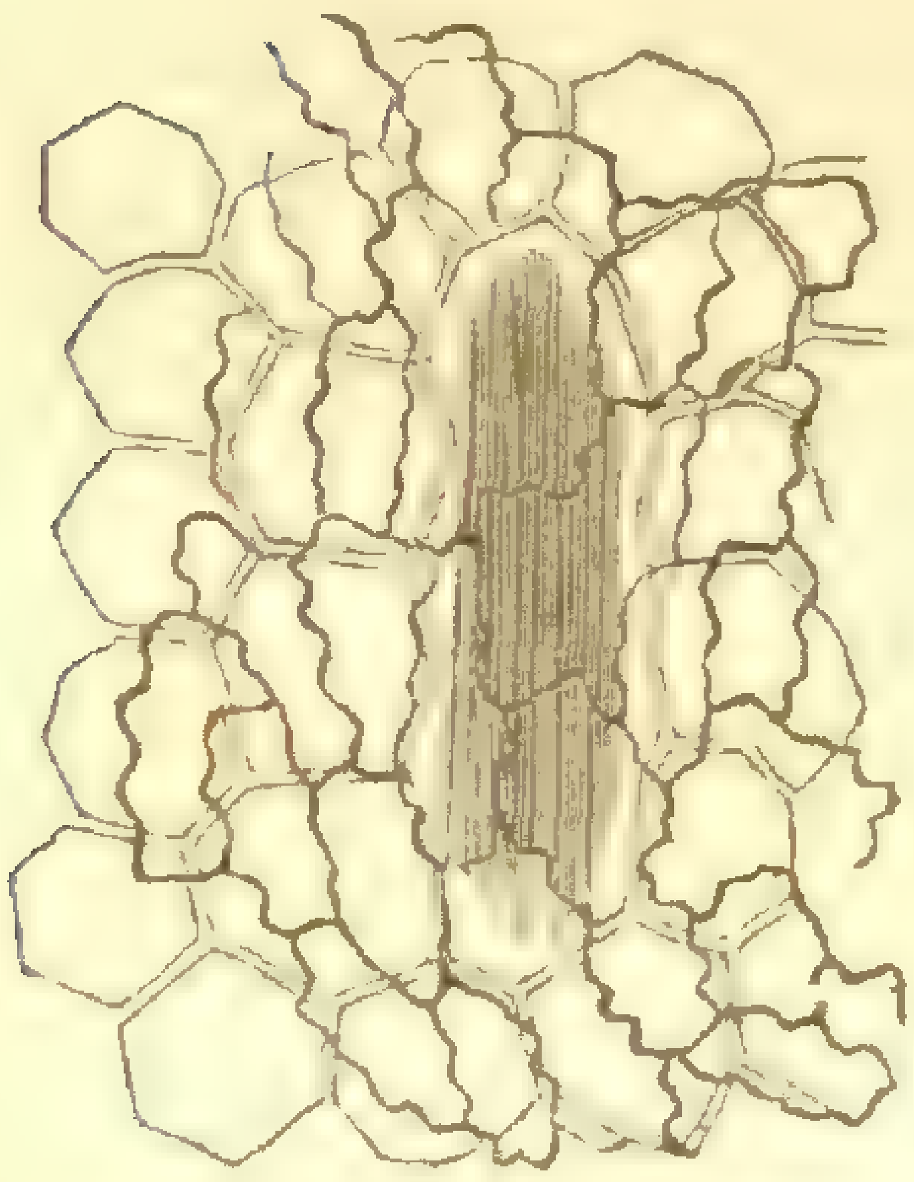


Fig. 2.

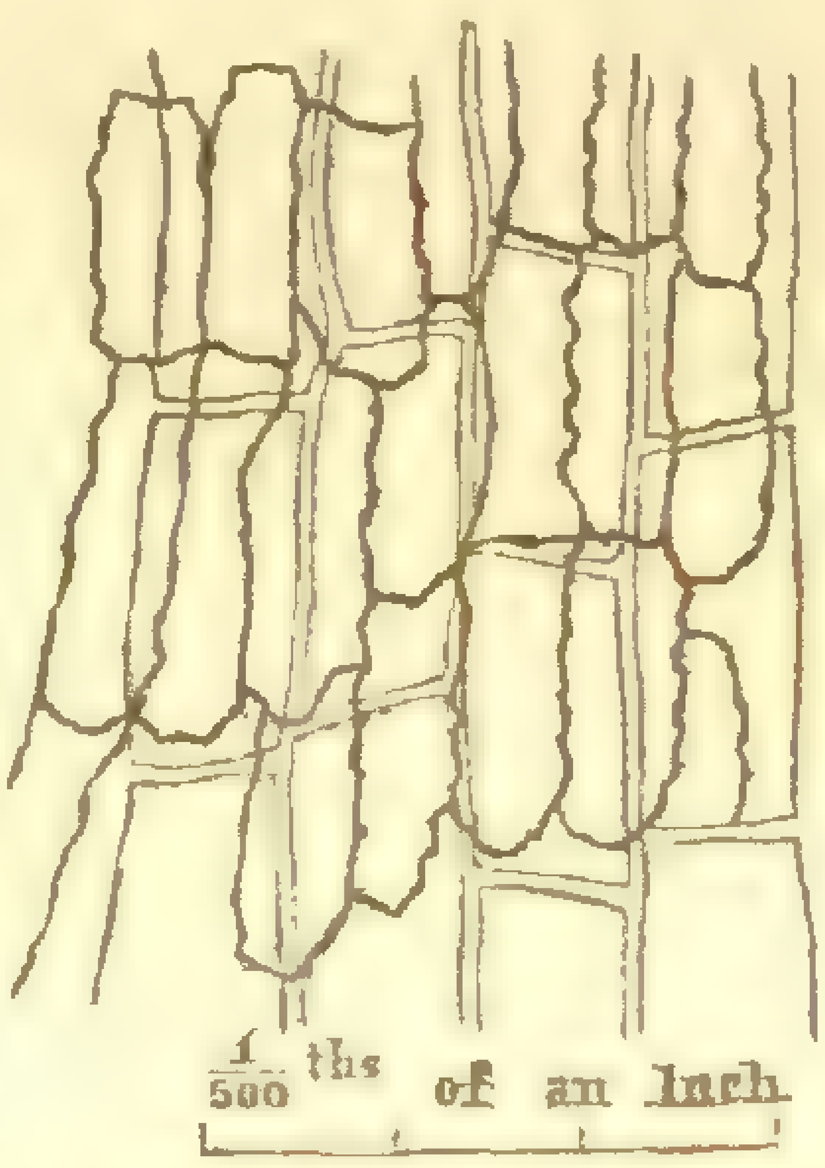


Fig. 3.

Fig. 1. Epidermis on the broad part of the frond of *Lemna trisulca*. The epidermis passes immediately over a bundle of raphides.

Fig. 2. Epidermis on the narrow part of the frond of *L. trisulca*.

Fig. 3. Epidermis on the under side of the frond of *L. minor*, and passing over a bundle of raphides.

Let us now review and elucidate some of these notes, and conclude with the historical point.

Epidermis.—This tissue is present in the form of wavy-edged cells, on both sides of the fronds of *L. trisulca*, and on the under as well as on the upper side of the fronds of other *Lemnæ*.

Root-sheaths.—Of these curious and characteristic "pileorhizæ," no-

ticed in the fourth volume of this Journal, there is neither an intelligible figure nor mention in 'English Botany.' Of morphological phenomena, the functional value may be none the less for its obscurity. In fresh *Lemnæ*, the root-sheaths afford some good specific characters, and should be compared in all the species, native and foreign, as well as with the like sheaths in other genera and Orders, as *Pistia* and *Pontederaceæ.* The calyptrate covering of the rootlets is beautiful in *Pontederia crassipes* and *P. azurea;* and, of *Pistia*, besides the rootlet-sheaths, there is a larger sheath on the tip of the root-axis.

Raphides.—These are small and fragile in *Lemna*. In the fourth volume of this Journal I have depicted the raphidian diagnosis between *L. minor* and *Wolffia arrhiza*. And after a careful examination of several preserved specimens of two species of *Wolffia* from Portugal and Angola, courteously sent to me by the eminent botanist Dr. Welwitsch, the exraphidian character was found very remarkable in every one of them. In some dried and colourless specimens of *Lemna minor* and *L. Angolensis* of the same collection, the fronds were so shrivelled, their cells failing to freshen out in water, and being beset and obscured by adherent Diatoms, that the raphides escaped detection at first. But bundles of these crystals were afterwards plainly brought into view, by thoroughly drying suitable and macerated fragments of the plants under pressure between glasses, then treating the preparation with turpentine, and subjecting it to a moderately high magnifying power.

Of *L. minor* I have examined an immense number of fresh specimens from various localities, and never failed to find the bundles of raphides without the least difficulty. And having during this autumn and in the month of November got a plentiful supply of *Wolffia arrhiza* growing among *Lemna minor*, *L. trisulca*, and *Riccia fluitans*, in the neighbourhood of Canterbury, I have repeatedly and diligently gone over the examinations again, and always with the same positive results. The fronds of the two *Lemnæ* invariably presented their bundles of raphides, while the *Wolffia* was as constantly destitute of them. These results are the more interesting, as all the plants were brought in the same bottle of water from one place, and thus confirm my former observations on the specific value of the raphidian character in *Lemnaceæ*, as well as the constancy of either the abundance, scarcity, or total want of raphides in different species of such nearly allied plants growing side by side in the very same pool.

To the same effect were the results of my experiments, formerly related, in which raphidian and exraphidian plants, grown from seeds in one pot of identical earth, produced and preserved these characters respectively from the very seed-leaves onwards. Surely the whole facts are cumulative evidence of the intrinsic connection of raphis-bearing with the cell-life of the species.

In short, as regards the Duckweeds, while *Lemna trisulca* and *L. minor* never fail to produce a good crop of raphides, these crystals are as regularly scanty in *L. polyrrhiza* and *L. gibba*, and so constantly absent from *Wolffia arrhiza* as to afford an excellent diagnostic character between this plant and *Lemna minor*.

But there are Orders of plants, both native and foreign, as more particularly explained by me in the fourth volume of the 'Popular Science Review,' truly distinguished as raphis-bearers; that is to say, Orders of which every true member yet examined has been found more or less pregnant with raphides, while the species of the next and nearest allied Orders are as regularly exraphidian. This phenomenon I have verified so repeatedly in our own flora as to leave little doubt so far on the subject. For example, in *Onagraceæ* we have thus a raphidian Order; while, on the contrary, in *Hydrocharidaceæ* we have an exraphidian Order standing between its allied Orders which are not less constantly abounding in raphides.

Endless confusion, however, will continue, unless we carefully bear in mind the difference between true raphides, sphæraphides, and crystal prisms, as described in the 'Popular Science Review' already cited. Thus, for want of such care, the sphæraphides which abound in some *Tetragoniaceæ*, *Chenopodiaceæ*, and *Haloragaceæ*,—beautiful examples of which crystals I have described in *Sesuvium*, *Atriplex*, *Chenopodium*, *Loudonia*, and *Haloragis*, as well as the crystal prisms in the bulb-scales of certain Onions, often noticed in my papers,—are still sometimes objected to my description of these plants as exraphidian. Again, the familiar sphæraphides and prisms of *Cactaceæ* are not true raphides; neither are the sphæraphides and sphæraphid tissue (Ann. Nat. Hist. for Sept. 1863, plate iv. fig. 13; and Aug. and Nov. 1865) of *Veratrum*, *Lythrum* and *Geranium*, *Aralia* and *Rhamnus*.

Discovery of the Raphidian Character in Systematic Botany.—The account of raphides in the forementioned number of 'English Botany' contains several errors, most of which may have been the compositor's

and all purely accidental. At present, it will suffice to notice that the quotation, as from me, under the head of "*Lemnacea*," was never mine either in spelling or meaning; and that the opening statement, surely a mere inadvertency, is equally calculated to mislead. Here it is:—"In a paper published in the 'Quarterly Journal of Microscopical Science,' Dr. Lankester called attention to the constant occurrence of raphides in certain Orders of plants, and since then Professor Gulliver has published a series of exhaustive observations on the subject."

Now, so far from following, I preceded Dr. Lankester in this inquiry, as plainly appears from his own paper, which was obviously written merely to introduce the subject to the readers of the Journal, then edited by him; but, though excellent for this purpose, without even a single original observation of his own concerning "the constant occurrence of raphides in certain Orders," while in that very paper he quotes one or other of my memoirs, previously published in the 'Annals of Natural History,' in proof of the ordinal value of the character sometimes afforded by raphides in systematic botany.

Canterbury, December 12th, 1868.

ON THE PHŒNIX OF THE HONGKONG FLORA.

BY H. F. HANCE, PH.D., ETC.

The existence of a wild Date-Palm in Hongkong was, I believe, first mentioned by Mr. Bentham, in his enumeration of the plants collected in the island by the late Lieut.-Colonel Champion;* without, however, any attempt to determine the species. Two years later, Dr. Seemann † referred my specimens of the plant to *P. acaulis*, Roxb., remarking that the presence or absence of a stem affords no reliable character in the genus. Mr. Bentham subsequently,‡ whilst retaining this name with a mark of doubt, observed that the genuine plant has a short bulb-shaped stem, and that the Hongkong specimens at his disposal were undistinguishable from *P. paludosa*, Roxb. At a later date, I described § the plant more in detail, pointing out that it

* Hooker's Kew Gard. Misc. vii. 33. (1855.)
† Bot. Voy. Herald, 416.
‡ 'Flora of Hongkong,' 340. (1861).
§ Ann. Sc. Nat. 5me sér. v. 247. (1866.)

differed entirely by its cylindrical caudex, 2–6 feet high, from *P. acaulis;* whilst *P. paludosa* is described and figured by Griffith * as growing in dense tufts, with slender annulate trunks, 12–15 feet high, and a graceful diffuse habit, and is besides known by the embryo being placed at the base of the seed, near the hilum, and not, as in the Chinese plant, in the middle of the dorsal surface of the albumen. I was disposed to regard it as probably different from any of the Indian species, but nearest to *P. silvestris*, Roxb.

I had then never seen it with fruit other than of a dull orange or vitelline colour, in which state it may even be met with exposed for sale in the streets of Macao, where it is called "Areca de mato," and eaten by the little boys, who do not seem to be repelled by its astringent inky flavour. It is probable that it does not habitually ripen its drupes here, or else that these are much sought after by birds; for, though common on the bare sterile sunny slopes of Hongkong, it was not till the summer of this year that I procured spadices laden with fully mature drupes; in which state they are quite black and glossy, and with a very agreeable, sweet, and farinaceous, though rather scanty pulp. A renewed comparison of the specimens with the characters of Roxburgh† and Griffith proves the Chinese Palm to be referable to *P. farinifera*, Roxb. That author's character is as usual very accurate, except that I do not notice any elevation over the cavity in which the embryo is lodged, and that more than a single pair of the lower pinnæ are reduced to spines. Whether the Anamese *P. pusilla*, Lour., be identical is as yet uncertain.

The species is dispersed over a wide geographical area, being met with on both the western and eastern coasts of the Indian peninsula, extending to a yet undetermined limit along the east coast of China, and, if Junghuhn's assertion ‡ that it was introduced thence into the Buitenzorg Garden be reliable, occurring also in Japan. Drs. Hooker and Thomson § mention it as a native of Ceylon, but probably through an error in determination, as *P. silvestris* is the only Singhalese species recorded by Dr. Thwaites.||

I may remark, that though this plant abounds along the coast, and

* Palms of Brit. India, 141. t. 229 B.
† 'Flora Indica,' iii. 785.
‡ Quoted by Miquel, Fl. Ind. Batav. iii. 63.
§ 'Flora Indica,' Introd. Essay. 120.
|| Enum. Pl. Zeylan. 329.

on all the islands at the mouth of the Canton River, a maritime atmosphere would appear absolutely essential to its existence; for I have never met with it along the banks of the river, nor indeed anywhere, except near the sea. This agrees well with Roxburgh's statement, that "it is a native of dry, barren ground, particularly near the sea."

As there is certainly but one *Phœnix* indigenous to Southern China, it is probable that Vachell's specimens, referred by Hooker and Arnott* to *P. dactylifera*, belong to this species.

Partly at the request of M. Naudin, made at a time when the species was undetermined, I have transmitted fresh seeds to him and a few friends in Europe, with a view to essay its introduction in the neighbourhood of Nice, and at Hyères, where there seems little reason to doubt it would grow readily, *sub dio.*

British Vice-Consulate, Whampoa,
October 28, 1868.

CARL FRIEDRICH PHILLIPP VON MARTIUS.

This great botanist, distinguished traveller, and most illustrious man died on the 13th of December, 1868, at Munich.

He was born at Erlangen, on the 17th of April, 1794. His father, Ernest Wilhelm Martius, who died at an advanced age in 1849, was, with Hoppe, one of the founders of Ratisbon Botanical Society, and author of a natural history 'Journey in Franconia and Thuringia,' and of the 'Memories of a Ninety Years' Life,' containing many interesting pictures of social life in Germany during the period embraced in it.

Carl Martius pursued his natural history studies in Erlangen, under the direction of his father and his father's friends. He was the botanical pupil of Schreber, the disciple of Linnæus, and editor of the eighth edition of the 'Genera Plantarum,' and to him he was undoubtedly indebted for the careful training in the fundamental principles of that science to which he was to devote his life, and which by his labours he was greatly to advance. But his studies were very

* Bot. Beechey's Voy. 219.

general, and he prosecuted all of them with enthusiastic devotion. He studied zoology under Goldfuss, chemistry under Hildebrand philology under Harless, and philosophy under Mehmes and Vogel. He had as his fellow-student Theodore Nees von Esenbeck, the author of the 'Genera Plantarum Floræ Germanicæ,' and together they prosecuted their studies at the house of the elder Von Esenbeck, at Wurzburg.

In 1814, he published his first work, 'Plantarum Horti Academici Erlangensis Enumeratio,' and at this time he was engaged in collecting the materials which, in 1817, he gave to the public as a 'Flora Cryptogamica Erlangensis.'

When Professor Schrank came to Erlangen to remove the herbarium of Schreber, which the Bavarian Academy purchased after his death, he made the acquaintance of Martius, and recommended him to come to Munich. Acting on this advice, he became a pupil of the Academy, and in 1816, he was appointed to an office in the Botanic Garden.

Maximilian, king of Bavaria, was interested in botany, and in his visits to the Botanic Garden observed Martius acting as director for Schrank, whose age incapacitated him for the duties. He accordingly selected him, with Dr. Spix the zoologist, to join as *savants* the embassy that was to accompany the young Austrian Princess destined to be the Empress of Brazil. On the 10th of April, 1817, he embarked in an Austrian frigate at Trieste. The plan of the expedition was prepared by the Bavarian Academy, and they resolved to explore as much as possible of that almost unknown region. They first visited the provinces of Rio and St. Paul, and then reached Pernambuco and Bahia, passing through the interior of the country, and enduring numberless difficulties, privations, and dangers. They made extensive collections in the province of Ilheos, and soon quitted Bahia for a still more extensive journey across the provinces of Piauhy and Maranham to the Amazon river, which they ascended as far as the confines of Peru. This expedition was completed, for the small sum of £2400, in three years, a distance of more than 4000 miles, through an untrodden region, having been travelled over without any serious accident. The collections brought home and deposited in the Munich Museum amounted to 3500 species of animals and 6500 species of plants.

The travellers hastened to draw up an account of their journeys, and to publish the vast amount of materials they had collected. Dr. Spix

had suffered severely from the tropical climate and the fatigues of the expedition, and survived his return only a few years, leaving the narrative of the journey to be finished by Martius, and the systematical zoological memoirs to be superintended by him, in addition to the botanical work which was properly his own.

The narrative of the journey, 'Reise in Brasilien,' consists of three quarto volumes and an atlas in folio. It is written in a clear and elegant style, and abounds with topographical and statistical details, descriptions of natural scenery and personal adventure. The specific descriptions of the plants and animals were reserved for special publication, but the work abounds with information on their geographical distribution.

The Palms were the first portions of his collections with which he worked, and the first part of the 'Genera et Species Palmarum' was published in 1823. This was intended to be confined to Brazilian Palms, but was ultimately extended so as to comprise a history of the entire family. The work was completed in 1850, in three large folio volumes containing 245 plates, most of them coloured, and some of them exquisitely finished landscapes, exhibiting the habits of the species in the scenery and among the plants with which they are in nature associated. The first volume treats of Palms in general, and includes a dissertation by Mohl on monocotyledonous stems, and another by Unger on Fossil Palms. The second volume is devoted to Brazilian species, and the third is a complete monograph of the Order. The singular fidelity with which the descriptions were made, and the figures drawn, make this noble work, although some portions of it are nearly fifty years old, equal to the most recently published monographs.

On a similarly magnificent scale did he design his 'Nova Genera et Species Plantarum Brasiliensis,' the first volume of which, by Zuccarini, was published in 1824; the only two other volumes of this work published were by Martius himself, the one in 1826, and the other in 1829–32.

The volume on cryptogamic plants 'Icones Plant. Crypt. in Brasilia collegit,' published between 1828 and 1834, belongs to the same series. To the descriptions of the Ferns by Martius was prefixed an elaborate dissertation on the structure of the stems of Tree-ferns by Mohl, accompanied with eight illustrative plates.

The magnitude of these elaborate works, and the time necessarily

required for their preparation induced him to attempt the more speedy publication of his treasures in a series of octavo volumes, without pictorial illustrations, but only two volumes were published,—one on Grasses by Nees von Esenbeck, and the other on Cryptogams, by Martius and others.

In 1829, he began the publication of his great work, the 'Flora Brasiliensis,' in folio, and from that time it may be said that the work of his life has been the carrying on of this publication. He has obtained the assistance of many of the most distinguished botanists to undertake different families, and these have been published as prepared, irrespective of any systematic order in the separate monographs. In addition to the materials obtained by Martius, all Brazilian collections before and subsequent to his expedition have been, as far as possible, included in the 'Flora,' and as Brazil is strikingly rich in many Natural Orders, the various monographs are often nearly complete for the group in question.

He began the distribution of his rich collections in 1837, in a series of fascicles under the title of 'Herbarium Floræ Brasiliensis.' He printed an introduction to this publication in the 'Regensburg Flora,' containing much interesting information on the labours of his predecessors, on the geographical distribution of vegetation in Brazil, and on the plan he had followed in determining his plants, and forming his herbarium.

Besides the purely systematic works in which he was engaged, he prepared a valuable history of all that was known, and that he had himself ascertained of the medical properties of the plants of Brazil. This was published in 1843, under the title 'Systema Materiæ Medicæ Vegetabilis Brasiliensis.' He classified his information under the various properties for which the plants were useful, as *Amylacea*, *Mucilaginosa*, *Saccharina*, *Acida*, etc.

Von Martius early showed a predilection for linguistic studies. His correspondence with Nees von Esenbeck, his fellow-student, was carried on in Latin, and his command of this language is exhibited by the elegant and eloquent dissertations which are interspersed among the more formal descriptions of his systematic works. When in Brazil he paid considerable attention to the languages of the natives, and to other ethnographical questions, and amongst his numerous avocations he has published several works on these subjects, such as 'Von dem Rechtszustande unter den Ureinwohnern Brasiliens' in 1832, 'Das

Naturell der Urbewohner Brasiliens' in 1843, and the work, which we believe he last published, contains a systematic and exhaustive account of his observations on these subjects, together with vocabularies of the languages of the Indian tribes of Brazil. This work was published in 1867, in two volumes octavo, under the title, 'Beiträge zur Ethnographie und Sprachenkunde Amerika's zumal Brasiliens.'

While yet a young man, he made his famous voyage to Brazil,—second only, in the importance of its results, to that of the illustrious Humboldt,—and his long life has been devoted to the elaboration and publication of the vast amount of materials he collected and observations he then made. Within the last few years he has been more than ever active in carrying on the publication of his great work the 'Flora Brasiliensis.' It is to be hoped that his decease will not interfere with the prosecution and completion of this great undertaking, and that the monographs now in progress—some of them nearly completed—will not be delayed in their publication.

But while thus engaged with the natural history of Brazil, his attention was not confined to this subject. He published monographs on Lychnophora (1822), Fridericia (1827), Amarantaceæ (1825), Sœmmeringia (1828), Ericocaulon (1833), Erythroxylon (1840), D'Orbigny's Palms (1843–46), and Agave (1855).

As Director of the Botanic Garden at Munich, he published at various times a history of the Garden, descriptions and illustrations of its more remarkable plants, and an account of the Royal Herbarium there.

Besides the officinal uses of plants, he investigated the bearings of his favourite science on agriculture.

As Secretary to the Mathematico-physical section of the Munich Academy, he delivered a large number of orations on the decease of illustrious members of the Academy. His extensive acquaintance with botanists, his candour and benevolence, and his ability to appreciate the labours of others, make these eulogies valuable estimates of the character and work of their different subjects, as well as eloquent tributes to esteemed friends. Amongst others may be mentioned those on Schrank, Zuccarini, Ledebour, De Candolle, and Robert Brown.

ON THE ECONOMICAL VALUE AND APPLICATIONS OF THE LEAF-FIBRE OF NEW ZEALAND FLAX (*PHORMIUM TENAX, Forst.*).

By W. Lauder Lindsay, M.D., F.R.S.E., F.L.S., etc.

Very various have been the estimates formed at various times of the economic value of the dressed fibre of the New Zealand Flax-plant. On the whole, I fear its value has been much exaggerated. The colonists have been in the habit of asserting, and on such excellent authority as that of the late Professor Lindley, that the fibre in question is more than double the strength or tenacity of ordinary flax, and considerably stronger than Russian hemp; and they add, that the plant will yield in cultivation per ton at least a half more fibre than Russian hemp. But the truest criterion of its value is the actual price it fetches, or could command, in the British fibre-market. Nominal or estimated value is a most fallacious criterion, especially when the estimate is formed by interested colonial referees, or their agents or friends at home.

Now, the Dundee fibre merchants of the present day—its jute and flax importers and spinners—rank New Zealand flax only with jute and the cheaper and coarser qualities of fibre. Unless it can be introduced here at £10 or £15 per ton, they say* it will not compete favourably even with jute. The finest qualities of common flax are at present valued at £50 per ton; and by the difference between £50 and £10 we may measure the estimate that has been on the whole formed in Dundee of the market value of New Zealand flax. A colonial paper states that a Dundee manufacturer estimated some "half stuff, sent from Otago, as worth £20 per ton for some descriptions of matting."† But isolated and individual estimates of such a kind are of little real or practical value. The Dundee spinners complain that New Zealand flax does not "tie;" but this may be the result of mal-preparation, because strips of the green leaf "tie" admirably. On the other hand, some specimens of New Zealand flax were produced at the New Zealand Exhibition of 1865, from Napier, valued at £70 per ton.

* My special informant was one of the partners of the well-known house of Cox Brothers, of Lochee.

† 'Otago Daily Times,' March 20th, 1867.

They were said to be as fine as Belgian flax, capable of being spun into the finest cambrics, samples whereof were also exhibited.* As the result of a series of comparative experiments with Russian hemp at £40 per ton, the writer in the 'Catalogue' (p. 156) says, "there can be but one opinion as to the superior strength" of New Zealand flax. He found trawl warps for fishermen made of that fibre successful in riding out a gale, while those made of Russian hemp gave way. "Samples" or selected specimens of the fibre used by him were valued in London at £33 per ton.

In the Auckland (New Zealand) market, flax dressed in its vicinity commands a market price varying from £30 to £50 per ton. In the Melbourne (Australia) market, New Zealand flax prepared in Otago, in the mills of Mr. Constable at Dunedin, fetches £25 to £35 per ton for "hay-lashing." There it competes with Manilla hemp, which fetches £35 to £40 per ton. In Dunedin, the same locally-prepared flax-fibre brings 35*s*. per cwt. for mattress-making, while the plant is collected and laid down at the mill for 20*s*. per ton.

That which really regulates or determines the market demand for New Zealand flax, however, is the *cost of its production*. Were this such that, adding the cost of freightage and the producer's and merchant's profits, the fibre could be presented to the British and other markets at a lower price than, or nearly equal price with, common flax, Russian hemp, jute, or Manilla hemp, it might hope to compete successfully with these at present cheaper and more abundant fibres. The cost of production has not hitherto, however, admitted of this. In the case of some, at least, of the samples of New Zealand flax shown at the New Zealand Exhibition of 1865, the cost of production *exceeded the market value*,—a circumstance, of course, ruinous to all hopes of its competing for the present with the fibres above mentioned. The Jurors of the Exhibition, indeed, express an opinion that New Zealand flax *cannot* compete with European flax; and they very sensibly and cautiously only venture the length of saying that it *should* successfully rival hemp for cordage and green cloths.†

Nevertheless, New Zealand flax at one time formed a very considerable *export* from New Zealand. In 1831, this single item of export amounted to £21,000 in value; and in the same year a manufactory for the pro-

* 'Jurors' Reports,' p. 119. † Ibid. p. 118.

duction of goods from New Zealand flax was established at Ormisby, Lincolnshire, though it was soon given up. In 1855, the value of New Zealand flax exports was between £5000 and £6000; in 1865, it had sunk so low as £75; while in 1866 it rose again to £996, whereof no less than £949 went from Auckland, and only £1 worth from Dunedin. These exports are, of course, in addition to the quantity consumed in home manufactures, no proper estimate whereof can be exhibited. These extraordinary fluctuations have been determined by such circumstances as native wars; the gradual decrease of the natives from the diseases and other concomitants of civilization; gold digging; the introduction of jute, Manilla hemp, and other abundant and cheap fibres of a comparable kind; the inferior preparation of New Zealand flax by Europeans; the varying requirements of, and consumption in, the colony itself; and the varying market demand for fibre of its class. Between thirty and forty years ago, New Zealand flax enjoyed in the European market a reputation which it has since apparently lost. There was a great demand for it, which was met by a corresponding supply, the Maoris engaging their women and slaves in the extensive cultivation of the plant and the preparation of its fibre.

Successive colonial governments seem to have had visions of future wealth and greatness springing from an extensive local manufacture of, and export trade in, New Zealand flax. Hence they have endeavoured to stimulate the ingenuity and perseverance of settlers by offering substantial premiums for success in the preparation of the fibre from the leaf. Such rewards are, however, scarcely necessary; for, from the days of settlement to the present time, the anticipations of *all* classes of colonists as regards the future financial importance of the native flax have been of the most sanguine kind. Hitherto it has been popularly supposed that the chief obstacle to the easy preparation of the fibre for manufacturing purposes is the difficulty of separating the *gum* of the leaf; hence Government rewards have been virtually offered to the "discoverer of a method of clearing the flax of its *gum*." But, even at the present day, there is no unanimity of opinion as to whether this is really the chief or only difficulty of the flax-producer. Constable, of Dunedin, a flax preparer, professes to separate the gum readily "by strong *chemical* solvents;" while Spey, analyst to the geological survey of New Zealand, reports, as the result of a series of special experiments, that the difficulties in preparing flax-fibre for use are of a

mechanical, and not of a chemical kind,*—that is to say, that specially adapted machinery is required, and not special chemical reagents. For myself, I believe that difficulties of *both* kinds exist; and even were these successfully overcome, there remain many other "Obstacles to the Utilization of New Zealand Flax," which I have discussed elsewhere.†

So long ago as 1856 (December 20th), the General Government of New Zealand offered seven premiums, amounting in all to £4000,—the first or highest being £2000, the second £1000, and five of £200 each,—"to the person who shall, by some process of his own invention, first produce from the *Phormium tenax*, or other fibrous plant indigenous to New Zealand, one hundred tons of *merchandise*."‡ The competition was open till January, 1859. It was stipulated that there should be a *bonâ fide* sale of the merchandise in Europe at an advance of 20 per cent. on the actual cost of the article when landed at any European port,—that is to say, that there should be a demonstrable *profit on the cost of production and sale.* Subsequently, the Government of Canterbury offered a premium of £1000, with similar aims; while, still more recently, the Provincial Government of Otago advertised a bonus of £530 to the person or company that shall first produce, within twelve months, a ton of *paper* from *Phormium tenax*, or other indigenous fibre, *equal in quality and price to imported paper.*§

Partly as a result of these offered rewards, partly springing from the high opinion of the value of New Zealand flax entertained by the colonists themselves, the experiments‖ made on the preparation of the

* 'Jurors' Reports of the New Zealand Exhibition of 1865,' p. 372.

† Proceedings of British Association, Section E. (Economic Science), 1867. Seemann's 'Journal of Botany,' 1867, p. 341.

‡ 'New Zealand,' by Stines, 1859, p. 33,—an essay to which the London Society of Arts awarded its silver medal.

§ 'Jurors' Reports of the New Zealand Exhibition,' p. 236.

‖ Some notice of the earlier experiments in question, and of the causes of their want of success, will be found in Dr. Thomson's 'Story of New Zealand,' 1859, vol. ii. p. 260. Reference may also be made with advantage to a work on *Phormium tenax*, by John Murray, F.S.A., F.L.S., which possesses the additional interest of being printed on New Zealand flax-made paper. I have not been so fortunate as to see a copy of this work, which would appear to be rare. A copy was shown in the New Zealand Exhibition of 1865, by the Hon. Wm. Colenso, F.L.S., of Napier ('Catalogue,' p. 17). Details of the more recent experiments on the preparation of the flax-fibre, along with the most trustworthy information regarding the growth of the Flax-plant will be found in the 'Jurors' Reports of the New Zealand Exhibition,' p. 429. Reference may also be made to the section on "Fibrous Substances and Manufactures," in the same 'Report,' p. 112.

fibre and its utilization in New Zealand itself have been legion. Patents innumerable have been taken out; money has been expended by thousands of pounds. Nevertheless, *no award of any of these attractive premiums has yet been made!* None of the host of experiments made, whether on the large or small scale, has yet come up, as respects market success, to the stipulated standard. *The history of flax-experiments in New Zealand is the history of a series of humiliating failures.* The colonist is forced to confess that he has not yet equalled nor improved upon the results obtained by the Maoris by mere hand-labour and processes of the most primitive kind. He has neither produced a finer fibre, nor has he succeeded in dyeing it with more brilliant or faster colours. Superior processes of preparation have yet apparently to be devised; while too little attention has hitherto been given to the at least equally important subject of the *cultivation* of the plant, with a view to its yielding the best kinds of fibre. Hitherto the colonists' operations have been conducted almost exclusively on the *wild* plant; though, as has been already shown, the Maoris have long recognized the superior value of the produce of the *cultivated* plant. There is, however, this other equally cogent reason for *cultivation*, if it be proved that the produce is of sufficient value to warrant the necessary expenditure of capital: *the native Flax-plant is rapidly disappearing* before advancing settlement and agriculture, with their concomitant, the development of an *immigrant flora*. Hence the fibre-supply must, at no distant date, if the demand grow at all larger, depend on the extent to which the plant is cultivated. The great anxiety of the settlers to utilize the fibre has arisen in connection with the apparent enormous waste of available material in the eradication of the Flax-plant from the soil, as a basis for agricultural operations, and its subsequent destruction by fire. But enough has been said, especially on the comparative advantages of using the *cultivated* plant, to lessen materially our regret that so much seemingly valuable fibre-stuff has been virtually squandered or neglected.

The recent New Zealand Exhibition at Dunedin, in 1865, appears to have assisted materially in revivifying, after such a series of disheartening failures, the interest of the colonists in the preparation and utilization of New Zealand flax. The Exhibition in question contained several most instructive suites of specimens illustrative of the products of *Phormium tenax*, and their economic applications. Of these,

probably the most complete and valuable were the exhibits of the Messrs. Davis, of Otaki, Wellington;* my friend Walter L. Buller, F.L.S., of Rangitiki, Wellington, also, showed an excellent series of flax-fibres, hand-prepared (scraped by mussel-shells†) by the North Island Maoris for the manufacture of their mats or cloaks.‡ These exhibits prove that the Maoris are still the best flax-dressers in New Zealand; no machinery, no chemical manipulation of the skilled or educated European, is yet able to compete with the hand-labour and the mussel or cockle-shell of the primitive native. It is indicative of the firm, unshaken faith of the colonists in its value that, notwithstanding a continuous series of failures and disappointments, experiments continue to be made, and capital sunk, in the attempt to render New Zealand flax applicable to the manufacture of cordage, textile fabrics, and paper. The failures in question have mostly happened in the *North* Island,—a circumstance that seems to inspire with hope the experimentalists of the *South* Island, for several of the most recent essays have been, or are being, made in the southern provinces of Otago and Canterbury. Not only so, but the northern colonists appear equally undaunted. A flax-mill was erected in November, 1866, at Whangamarua, Waikato, in the midst of a country as yet wild and abounding in flax-swamps; and various similar efforts have been made from time to time in the province of Auckland. Nay, even at home there are still enthusiasts found to engage in the manufacture on the large scale of New Zealand flax produce. In the 'New Zealand Examiner' of June 13th, 1863, there is an advertisement or prospectus of a "New Zealand Flax, Hemp, and Cordage Company, Limited," to work the patent of Lieut.-Col. Nicolle, in Jersey. It does not appear whether, in this case, the plant operated on is grown in Jersey, or is imported from New Zealand, for it thrives vigorously as a hardy plant in our Channel Islands. Among the most recent local experiments, are those of Ed. M'Glashan and W. S. Grieve, in Dunedin, Otago, in March, 1867, on the applicability of New Zealand flax to paper-making. A New Zealand flax

* 'Exhibition Catalogue,' pp. 75 and 125.

† Apparently the *Mytilus canaliculatus*, Martyn (Dieffenbach, vol. ii. p. 258). Other authorities describe the Cockle (*Cardium* sp.?) as the shell used. I found both shells abundant in all parts of New Zealand. They are common in the numerous "shell-mounds" that are distributed on its coasts. In all probability, sometimes the one shell, sometimes the other, is or was used in different districts and by different tribes.

‡ 'Exhibition Catalogue,' p. 25.

manufactory was also recently established at Christchurch, by A. Cameron, who exhibited specimens of his "half-stuff" in the New Zealand Exhibition of 1865. Flax-mills have been of late erected in Otago, by Mr. Constable, at Pelichet Bay, Dunedin, and by Mr. Mansford on the Cluthe, Port Molyneux. The former mill was, in June, 1867, examined and reported upon on behalf of the Otago Government by my friend J. T. Thomson, C.E., the provincial engineer: "The manufacture," he says, "I consider a complete success." Constable's mill turns out 3 cwt. of fibre per day, and can produce 30 cwt. per week. The epidermis and gum are separated partly by chemical, partly by mechanical means; the resultant fibre is said to be of excellent quality, and to *promise* to be marketable at a moderate price.* But, alas! similarly favourable reports have been made over and over again as to New Zealand flax, and yet it has no permanent place in the fibre market. Time alone can show how far, in this instance, these promises will be performed,—whether these anticipations are not, like so many of their predecessors, doomed to disappointment.

Applicability to the Manufacture of Cordage.—The value of New Zealand flax as a material for cordage, has been better tested and longer established than its applicability to the manufacture of textile fabrics or paper. E. W. Frent, of Brooksby Walk, Homerton, rope and twine spinner, exhibited specimens of the dressed flax and of rope, twine, etc., made from it in the International Exhibition of London, in 1851; and in 1863 he gave much information as to its use in rope spinning, especially in contrast with Russian hemp, in the 'New Zealand Examiner' (September 15th, p. 207). It is suitable especially he says, for bale-rope and bolt-rope. He regards it as unfair to employ the same processes of manufacture as in Russian hemp. He establishes, indeed,—apparently satisfactorily,—the strength and usefulness of the fibre, when properly prepared; but the question of *cost of production of a marketable article*, such as to leave a profit and still be under the price of European hemp and flax, is still left—by such experiments as his—as *the* great question for determination by the colonist. Thomson regards Constable's Dunedin fibre as equal to Manilla hemp; he anticipates it will compete with Manilla in the manufacture of the better qualities of rope in the Melbourne market,

* 'Otago Daily Times,' July 27th, 1867.

where the expected demand for this class of fibre for cordage alone is ten tons per week. The New Zealand Exhibition of 1865 contained an instructive suite of samples of cordage made from New Zealand flax, from the coarsest ship-rope to the finest thread, including clothes-lines, fishing lines and nets of twisted flax-fibre, and twine. Ships' cordage is reported to be excellent as to strength, but it does not absorb tar freely. For cordage, especially, it is still supposed that the New Zealand flax fibre is deteriorated by the *gum*, from which it has hitherto been found impossible altogether to free it. A New Zealand flax ropery once flourished in Auckland, but its operations were stopped by the irregularity of the supply of the fibre consequent on the native rebellion of 1863. Excellent ropes were shown in the International Exhibition of London in 1862, by Auckland patentees (Messrs. Purchas and Mimis). New Zealand flax-made cordage is now largely used in the North Island, both by settlers and Maoris.

Applicability to the Manufacture of Paper.—B. M. Cameron, of Edinburgh, the editor of the 'Paper Trade Review,' and himself both a paper manufacturer and an ingenious experimentalist, reported very favourably of New Zealand flax-made paper in a letter to the 'Times,' in September, 1863. He describes it as "superior, both in strength and capability of finish, to that made from most of the rags now used. From experiments I have seen made . . . I am convinced there is not a better material to be had for the purposes of the paper-maker." On the other hand, the Chevalier de Claussen, in his experiments on the fibres suitable for paper-making,—the results whereof were laid before the British Association in 1855,—found that the fibre of *Phormium tenax* was both expensive to prepare and nearly impossible to bleach.* The paper on which Murray's work is printed is described as resembling that used for Bank of England notes; in colour it is, however, brownish, and in texture coarsish, containing a considerable number of specks,—both the result, perhaps, of defective manufacture and bleaching. The paper in question was, however, manufactured in England from New Zealand flax sent home; and paper made also in England so lately as 1866, from fibre prepared by M'Glashan and Grieve, has apparently similar characters. The latter paper is described

* 'Athenæum,' September 29th, 1855, p. 1126.

in the colonial journals as "rather highly coloured," with a "singularity of texture," a toughness or tenacity, which suggest its use in documents intended to stand great wear and tear.* Hence it is expected to become "a very excellent paper for bank notes and other special purposes; while the paper, as sent from Britain, would assuredly become an article of commerce, supposing that the *cost of production* is not excessive." The New Zealand Exhibition of 1865 contained various samples of native flax-made paper, and of books, etc., printed thereon, as well as "leaf-stuff," or other stages in the conversion of the half-fibre into paper. In 1859, an attempt—apparently unsuccessful—was made to establish in Wellington a manufactory of paper from New Zealand flax (Stone's); and we have already seen that a paper-mill of a similar kind has recently been erected in Canterbury.

I believe the colonists entertain exaggerated ideas of the value of New Zealand flax as a paper material. There is no sufficient evidence that paper manufactured in English paper-mills, from selected samples of dressed fibre, possesses the qualities required in ordinary paper, and even were it proved that the New Zealand flax-made paper is of greatly superior quality to that produced from rags or straw, which are waste materials, and necessarily both abundant and cheap, or from esparto, which is also cheap in Europe,—the important question of the comparative cost of production of paper pulp, or "half-staff" from New Zealand flax, remains unsolved. It is obvious that unless "half-staff," or some equivalent from New Zealand flax can be introduced into the European or Colonial market at a price lower than that from rags or straw, it has no chance of successfully competing with the latter as a paper material. The use of dressed fibre is evidently rendered impossible by its great expensiveness, but in the event of its utilization in large quantities in the manufacture of cordage or textile fabrics, the waste or refuse, such as refuse tow from the hacklers, or the waste of rope-spinning, might become available locally for some classes of paper. The jurors of the New Zealand Exhibition of 1865 suggest that it would be more profitable to export, for manufacturing purposes at home, the New Zealand flax fibre half prepared, and that it might with greatest hope of success be used in combination with other less strong or coarse fibres. All such anticipations or suggestions are, however, premature,

* 'Jurors' Reports of New Zealand Exhibition of 1865,' p. 124.

till it can be shown that the quality, on the one hand, and the cost of production on the other, entitle New Zealand flax to a sure footing in the fibre market.

(To be continued.)

BOTANICAL NEWS.

Adalbert Schnitzlein, Professor of Botany, and Director of the Botanic Garden at Erlangen, died, aged fifty-five years, on the 24th October, 1868, from the result of an accident while botanizing in the Tyrol. The author of a 'Flora of Bavaria' and a 'Monograph of Typha,' he was better known by his 'Iconographia Familiarum Naturalium Regni Vegetabilis,' which is unfortunately left incomplete.

Edward Pœppig, Professor of Zoology at Leipsic, died on the 4th of September, 1868. He was born at Plauen, on the 16th of July, 1798. In the years 1827–29 he travelled in Chili, Peru, and the basin of the Amazon, and, on his return to Europe, published a narrative of his expedition, and, with Endlicher, an account of his plants in three folio volumes, with 100 plates in each.

Franz Delessert, the surviving brother of Benjamin Delessert, and the possessor of his valuable herbarium, died at Paris on the 15th of October, 1868.

Christian Friedrich Ecklon has recently died at the Cape of Good Hope. He was born at Apenrade, in Schleswig, on the 17th of December, 1795. After studying medicine he went to the Cape as an assistant to an apothecary, and during the four years he occupied this position he investigated the flora of the neighbourhood. At the end of this time he devoted himself entirely to botanical investigations. He brought his collections to Europe in 1828, and, after distributing them, he arranged to return to South Africa for further exploration. He visited the vicinity of Cape Town, and then made a journey into Caffraria, He returned to the same region afterwards in the company of Zeyher, and, having amassed a large and valuable collection, the two explorers returned to Hamburg, in 1832, to superintend their distribution, and to publish a description of the novelties, which they did in their 'Enumeratio Plant. Africæ Australis Extratropicæ.' He returned again to the Cape, where, with the exception of another short visit to Europe, he has remained, quietly pursuing his botanical investigations until his death.

We understand that the Horticultural Society of Russia has appointed Dr. M. T. Masters, Spring Grove, Isleworth, and Mr. H. J. Veitch, King's Road, Chelsea, as its representatives in this country, with the object of promoting the interests of the International Horticultural Exhibition to be held under its auspices at St. Petersburg in May next.

Edinburgh Botanical Society.—The first meeting of the Society for the thirty-third session was held at Edinburgh, on Thursday, the 12th of November, when the President, Mr. Charles Jenner, delivered an opening address on botany as a means of mental culture. The following communications were read:—I. "Description of *Hieracium collinum*, Fries, a New British Plant." By Professor Balfour. Specimens and drawings of the plant were exhibited. (See 'Journal of Botany,' Vol. VI. p. 353, Pl. LXXXVI.)—II. "Notice of *Grimmia contorta*, Schimper, a New British Moss." By Professor Dickie. This moss was discovered by Mr. John Sim, Strachan, growing in considerable quantity on the great rock of Clochnaben, Kincardineshire, in June, 1868. Specimens were exhibited and presented to the herbarium.—III. "Extracts from Botanical Correspondence." By Professor Balfour. 1. From Mr. Shuttleworth, Berne, giving an account of the botany of the Var and of the Alpes Maritimes, and part of Liguria. 2. From Professor Dickie, noticing the naturalization of *Lupinus perennis* in several places on Deeside. 3. From Mr. Gilbert A. C. Stewart, enumerating the plants naturalized on the banks of the Tweed, the seeds having been introduced by wool brought to the Galashiels factories. 4. Mr. Archibald Jerdon, transmitting specimens of *Polycarpon tetraphyllum* and *Medicago denticulata*, collected near Melrose. 5. From Mr. P. S. Robertson and Mr. Henderson, presenting specimens of potato tubers exhibiting the second growth, where numerous tubers are produced from a parent tuber. 6. From Mr. J. F. Robinson, giving a list of the ferns found in Cheshire. Professor Dickson gave a demonstration on the hard structure of the pith in the Akiaga ordeal poison plant of West Africa. Specimens were shown under the microscope.

Local Names.—It is desired to collect as many as possible of the local names of British plants; and the assistance is requested of all who take an interest in the subject, or who may have the opportunity of ascertaining and recording them. Any lists sent to Mr. James Britten, High Wycombe, or to Mr. Robert Holland, Mobberley, Knutsford, will be thankfully received and acknowledged.

Tab 898

W. H. Fitch. del. et lith.   Vincent Brooks, Day & Son, Imp.

ON *RUBUS BRIGGSII*, *Blox.*, A NEW SPECIES FOUND IN DEVONSHIRE.

By the Rev. Andrew Bloxam, M.A.

(Plate XXXVIII.)

Rubus Briggsii, sp. n. Stem fuscous, prostrate, angular, covered with hairs and setæ; prickles small, unequal, slightly declining, with a compressed base; leaflets generally 3-nate, closely and not deeply dentate, hairy on the prominent veins beneath. Central leaflet broadly cordate; basal leaflets nearly or entirely sessile, overlapping the central one. Panicle short and dense; sepals adpressed to the fruit; leaflets of the flowering stem all 3-nate, the basal ones sessile, overlapping the central one, which is cordate, quite as broad as long.

The peculiar aspect of this species is very distinct from any that I have previously met with, either British or Continental, and in this opinion Mr. J. G. Baker, who has a most extensive collection of foreign as well as British specimens, coincides. It comes nearest to *R. fusco-ater*, W. and N., but is quite distinct. I have named it *R. Briggsii*, from its discoverer, who has found several plants of it in the Vale of Bickleigh, Devon.

STATIONS OF, AND NOTES RESPECTING, SOME PLYMOUTH *RUBI*.

By T. R. Archer Briggs, Esq.

For some time past I have had the pleasure of carrying on a correspondence with the Rev. Andrew Bloxam respecting the *Rubi* of the neighbourhood of Plymouth, and it is principally through his kindness in having named numerous specimens for me, sent from this locality, that I am now enabled to give the following particulars respecting the local distribution of the *Rubi* named below. It will be seen that my thanks are also due to Professor Babington, for having kindly given me his opinion on a few; and I am under great obligations to Mr. J. G. Baker, for the assistance he has afforded.

It must not be supposed that the list is anything like a complete one of the *Rubi* of Plymouth, for many doubtful plants, etc., are

reserved for further study. About these I may possibly be able to say something at a future time.

R. Idæus, Linn. Common, and doubtless truly wild in many spots, but it springs so readily from seed, and is so much cultivated, that it is impossible to say in what localities it is indigenous. By the Cowsic river, on Dartmoor; remarkably common in hedges by the Tavistock and Okehampton road, within a few miles of the former place; plentiful near Peter Tavy, where the yellow-fruited plant occurs; in a wood at Torr, near Yealmpton; Common Wood, etc.

R. suberectus, Anders. In open spots in many of our wooded valleys, especially where the soil is moist. Also frequent among low copsewood on the hillsides, but not a hedgerow shrub. In the valley of the Plym at Common Wood, Cann, etc., and by some of its tributary streams; in a wood at Derriford, Egg Buckland; in the vale of the Yealm, near Cornwood; at Blaxton, etc.

One of the earliest species to flower, in South Devon coming into bloom at the end of May or beginning of June.

R. plicatus, W. and N. Specimens so named by the Rev. A. Bloxam were obtained from a bog at Ivybridge and a bushy spot at Blaxton, near Tamerton Foliott.

R. affinis, W. and N. By the side of a road near Beer Ferris, leading towards Lopwell; valley of the Yealm, Dartmoor; some bushes on the right bank of the Plym, near Riverford. Mr. Bloxam considers the plants at the first and second stations this; and Mr. Baker calls the Beer one and the last *affinis*, but says that by this name he may not mean quite the same plant as do some botanists, since by it he understands one that is "apparently essentially the same as *nitidus*, W. and N."

R. rhamnifolius, W. and N. Probably common. In a waste spot by the Plymouth and Saltash road, near the ferry across the Tamar, etc. Many bushes of a small form of this occur in a waste but enclosed piece of ground on the right of the Saltash and Callington road, after you descend the hill below Hatt, Cornwall. We probably have also *R. cordifolius*, W. and N., included with this by Babington in his 'Manual of British Botany,' for a plant respecting which the Rev. A. Bloxam writes, "I believe *cordifolius*," and Mr. Baker "one of the *cordifolius* set of forms,"—grows in a hedge by the Plymouth and Tavistock road, between Knackersknowle and Roborough, near a

house named Powisland; also on a bank close to where the South Devon Railway crosses the lane leading from the higher part of Ridgeway to Newnham.

R. ramosus, Blox. Common in open spots in woods, and in bushy places in their neighbourhood. This plant varies but little, and seems very distinct from all our other species. The remarkably glossy upper surface of its frequently convex leaves, its lax, branched, abrupt panicle, and small, irregularly-formed fruit, are characteristic features. The Rev. A. Bloxam says of it, "Not uncommon in Warwickshire and Leicestershire; I think closely allied to, if at all distinct from, *Schlikumi*, Wirtg., though my specimens vary a little;" and Mr. Baker, "No doubt *ramosus*, Blox., probably = *Schlikumi*, Wirtg." By the Plymouth and Dartmoor "tramway," near the Leigham tunnel, at Maidstone, Fancy, and Wombwell; in a bushy spot below the elvan quarry on Derriford estate, and at Bircham, Egg Buckland; in a hedge near Dedham Bridge, and in the neighbourhood of Beer Alstone; between Knackersknowle and Tamerton Foliott; in the lane between Elfordleigh and Newnham Park; in the Plym valley at Common Wood, near Plym Bridge, and about Rumple; also at Blaxten; near Inchers, etc.

R. discolor, W. and N., inclusive of *R. fruticosus*, Sm. The plant now usually called *R. discolor* by British botanists, the *R. fruticosus* of Smith, is probably the commonest hedgerow bramble of the neighbourhood of Plymouth, and often occurs in very exposed situations. Sometimes the petals are of a very bright pink. It continues to produce its hard, regularly-formed, but poorly-flavoured fruit until frost sets in. With reference to specimens of this from Wembury and from Fursdon, Egg Buckland, the Rev. A. Bloxam observes "the common form of what is called *discolor* in this country;" and Mr. Baker, "the common form of *discolor* all over England. Genevier and Mercier call it *rusticans*."

Respecting a more robust plant, with larger and broader leaves, and a few aciculi on the barren stem and panicle, gathered by the Plymouth and Ivybridge road, the latter says, "probably what those who call the last *rusticans* would regard as true *discolor*;" Mr. Bloxam, "the true *discolor* of Weihe and Nees, as I believe." Forms occur in a waste spot by a quarry near Ford, Devonport, and by the tramway near Marsh House, Crabtree, etc. A curious plant, with very deeply-

cut leaves, grew some years ago on a bank at the top of Crown Hill, Knackersknowle; but works in connection with the new fortifications around Plymouth having, since then, made it necessary for the bank to be levelled, it was entirely destroyed a few years ago. Mr. Bloxam at first regarded it as a variety of *fruticosus*, W. and N., but now, I believe, considers it was the *R. laciniatus* of Willdenow, and distinct. I incline to his first opinion as to its being a variety.

R. leucostachys, Sm. In waste spots by roadsides. The typical plant is easily recognized, but puzzling ones near it often occur. In a quarry by the Plymouth and Saltash road; in a waste spot between Knackersknowle and Tamerton Foliott, near the abandoned mine; Wombwell, etc.

R. Salteri; a. Salteri, Bab. Man. Brit. Bot. ed. 6. "Bloxam." Rather frequent in low but open situations. On the right bank of the Plym, in a marsh below Crabtree, also on the same side of that river near Leigham Lodge; by the Egg Buckland road, near Plym Bridge; under some trees, forming a small grove in one of the marshes between the Laira estuary and Plympton St. Mary church; in a waste spot near Newnham, close to the bridge over Tory Brook, and by the lane leading up by the latter place out on Crownhill Down; in the vale of the Yealm, by the path leading from the village of Cornwood to the waterfalls; by the Plymouth and Yealmpton road, near Brixton, just beyond the fourth milestone from Plymouth; between Ivybridge and Ermington; a bush on a hedgebank by the Plymouth and Tavistock road, between Powisland and the George Hotel, etc. The wavy edges of the leaves, and, as Mr. Bloxam observes, "sepals at right angles with the flower," give this a peculiar appearance. He has had specimens of me from many of the stations named above, and says that this plant is quite distinct from his *calvatus;* but Professor Babington firmly maintains the contrary, for, after examining specimens that I sent him from the station near Brixton, he wrote, "I think your *Salteri* from Brixton is the *β*. of that plant, viz. *calvatus* of Bloxam; certainly not the true *R. Salteri* of the Isle of Wight."

R. calvatus, Blox. The Rev. A. Bloxam says that a plant that grows rather plentifully in hedges near Beer Alstone is this. It occurs also in a hedge between Roborough and Lopwell, near a house named Axter Gate, but seems to be a local plant. Mr. Baker also has had it of me from the former station, and he regards it as the true *Salteri, a.*

of Babington's Manual, ed. 6, for he says of it, "Good *Salteri*. I studied this at the original locality for *Salteri* in the Isle of Wight (Apse Castle Wood) last autumn, and your plant is just the thing." The panicle of this is long, leafy, narrow, and very lax, with long, slightly declining prickles. The leaflets are not so much narrowed to their bases, or so deeply cut, as are those of the *Salteri* of this list. They differ also in being not at all, or only slightly, wavy at the edges. The barren stem is copiously furnished with long, strong, and nearly patent prickles, whereas those of the other are comparatively short and declining.

R. villicaulis, W. and N. In woods and bushy places. By the roadside, near Looseleigh toll-gate, between Knackersknowle and Tamerton Foliott; by a path through a wood in the Plym valley, near the river, between Plym Bridge and Rumple, and about the latter place. Mr. Baker is inclined to refer other plants, sent from several places near Plymouth, to this species.

R. carpinifolius. W. and N. "Bloxam." *R. macrophyllus*, *a. umbrosus*, Arrh. "Babington, Man. Brit. Bot. ed. 6." In hedges in many localities, but not one of our commonest plants. At Ham and Pennycross, near Plymouth; about King's Tamerton, and between that place and Swilly; in a lane leading from Knackersknowle toll-gate to S. Budeaux, and between the former place and Roborough; on Saltram Embankment. By a path leading from the heights at Maker (this parish is in Devon, but across the Tamar) into Kingsand village, and in a lane between the latter place and Milbrook; at Combe, near Saltash, Cornwall.

It will be seen that Professor Babington and the Rev. A. Bloxam differ in opinion about this plant.

R. macrophyllus, Weihe. By the Plymouth and Yealmpton Road, near Brixton, about four miles from Plymouth, growing with *R. Salteri* of this list; about Plympton; in a lane leading into the Colebrook and Plym Bridge Road from the Crabtree and Plympton Road; on a bank by the Tamerton Road, between the abandoned mine and Looseleigh toll-gate.

R. mucronulatus, Bor.; *R. mucronatus*, Blox. On hedgebanks between Roborough and Lopwell, and on one by the Plymouth and Tavistock Road, between Down House and the George Hotel; by the side of the Plym Bridge Road, between Fancy and the cross lane that

leads from Thornbury to Common Wood; near Bickleigh. Mr. Bloxam has had specimens from all these localities, and says of them, "all, I think, *mucronatus*;" Mr. Baker, referring to the same, "may do for *mucronatus*, but they look to me a stage nearer *villicaulis* than Bloxam's original plant, and one exactly identical, which is common in Yorkshire." In a hedge at Ford, near Devonport.

R. Bloxamii, Lees. By a roadside, near Marsh House, Crabtree; also in a waste spot on the Saltram side of Laira bridge.

R. rudis, Weihe. Apparently rare in the neighbourhood of Plymouth. In a hedge between Beer Ferris and Morwelham. A short time ago I sent specimens of this plant, labelled "*rudis*," to the Rev. A. Bloxam, and he agreed with me as to its being this; but Mr. Baker says of it, "what you call *rudis* is about halfway between the true plant and *Radula* in leaf and prickle. I have seen something very like it in Yorkshire." The leaves are certainly less dentate than those of *rudis* sometimes are, but the nearly equal aciculi, setæ, and hairs of the barren stem seem to me quite characteristic.

R. Radula, Weihe. The commonest plant of the *Radulæ* set in the neighbourhood of Plymouth. Above "The Combe," Egg Buckland; in a hedge by the Plymouth and Tavistock road, close to the entrance gate of Down House; on a limestone rubble-heap at Pomphleet; between Plymouth and Saltash, about two miles from the former place; on top of a hedgebank at Fuzzet Hill, Lipson, etc.

R. Koehleri, Weihe, inclusive of *R. pallidus*, Weihe. A variable plant, common in and about woods. On a bank below the wooded mound overlooking Plympton on the S.W.; near Colebrook village, by the side of the hedge between the field path and the road leading towards Newnham Lodge; in hedges by the Plymouth and Tavistock Road, between Fancy Lane and the entrance to Wombwell Farm; in various waste spots at Common Wood; in the lane between Bickleigh village and Combe Park Farm, etc.

R. fusco-ater, Weihe. Plentiful by a path leading from the "tramway" at Common Wood towards Bickleigh Vale. The Rev. A. Bloxam has pronounced this to be the above species, and Mr. Baker says of it "good Babingtonian *fusco-ater*." A coarser plant, with stouter barren stem, and a more rigid rachis to its longer and less compact panicle, which is less uniformly hairy and setose than in the Common Wood *fusco-ater*, is quite a common bramble in open spots

near woods, on hedgebanks, and by roadsides. I have noticed it at Crabtree; by the Plymouth and Yealmpton road, near Brixton, about four miles from Plymouth, close to where Bloxam's *Salteri* and *macrophyllus* occur; on a bank between Plymstock and Knighton; in a lane at Newnham; between Tamerton Foliott and Roborough, etc. I have specimens from all these localities in my herbarium, and Mr. Baker, referring to some from several of them, says that they are identical with a plant that he has often gathered in the north of England, which is about intermediate between *fusco-ater*, as figured in 'Rubi Germanici,' and *macrophyllus*. Weak specimens of this often look much like *pyramidalis*, Bab.

R. diversifolius, Lindl. Local, having apparently a partiality for calcareous soils. In hedges by Puslinch Lane, near Kitley Lodge; by the turnpike road between Yealmpton and Ermington, near Yealm Bridge; in a waste spot, near a limestone quarry, on the left bank of the Yealm, just opposite the Kitley cavern.

The white blossoms of this are large and handsome, and the light hue of its foliage is remarkable.

R. pyramidalis, Bab. By the Plymouth and Dartmoor "tramway," near where it spans the Plym Bridge Road, and in a wood beyond this spot, between Rumple Quarry and Common Wood; in a bushy spot close to the elvan quarry on Derriford Estate, Egg Buckland: sparingly in hedges by the lane leading out on Crownhill Down, from Colebrook; in a bushy lane between Newnham Park and Elfordleigh, and in a waste spot in the same neighbourhood, near Loughton Mill; in Bickleigh Vale, near Common Wood; in a lane between Bickleigh village and Combe Park Farm; at Ham, near Plymouth, etc. The Rev. A. Bloxam, on receiving specimens from one of the Plym localities and from Derriford, wrote, "*pyramidalis*, Bab. I have seen this from only one locality before, Llanberis, N. Wales;" and Mr. Baker "excellent *pyramidalis*, I have seen the Llanberis plant growing there." This will, I think, prove to be a rather common woodland bramble in the neighbourhood of Plymouth.

R. Guntheri, Weihe. A good deal of what Mr. Bloxam calls "very characteristic," and Mr. Baker, "excellent *Guntheri*," grows by the path leading from the "tramway," across Common Wood, towards Bickleigh Vale, but it is not a common plant. A *Rubus* near this occurs on a hedgebank below Bircham Cottage, Egg Buckland.

R. foliosus, Weihe. In hedgerows by the Plymouth and Ivybridge road, near the Lynham Inn, and in the lane leading from Ivybridge towards Caton; plentiful in woods between Stretchley Farm and Yeo; in hedges by the hill between Lynham and Efford, also between the latter place and Blackpool; in a large wood on the right of the Tavy, above Dedham Bridge; in a wood between Lopwell and Beer Alstone, Blaxton. When luxuriant, the immense leafy panicles are very striking, and then the woodland form differs considerably in general appearance from a small one that occurs in hedges between Knackersknowle and S. Budeaux, and in lanes between Honicknowle and Weston Mills. Sometime ago I sent Professor Babington the larger plant from one of the stations near Ivybridge, and he said of it, "I quite think *foliosus*, as named by Bloxam."

R. Balfourianus, Blox. Apparently rare. In a low hedge between Sequer's Bridge and Kingston village. A plant near this I have gathered from a bank by the Erme, near Kitley. The Rev. A. Bloxam says it exactly accords with *R. deltoideus*, Müller, n. 84, Wirtgen's *Rubi*.

R. corylifolius, Sm. Common in hedgerows in low situations in the immediate neighbourhood of Plymouth, as at Tothill, etc., and, in many spots on limestone one of the commonest *Rubi*, showing, like its ally, *R. cæsius*, a partiality for calcareous soils, but by no means confined to districts where these prevail. Close to a house called Axter Gate, near Roborough; by the turnpike road between Ridgeway and Ivybridge, etc.

R. cæsius, L. Near Tothill; by the Tavy at Tavistock; near Ermington. Common in the limestone districts to the east of Plymouth, as Cattedown, Elburton, Plymstock, near Pomphleet, etc. It begins to flower early, for I have found ripe fruit in July, and continues in blossom for three or four months. The fruit abounds in a gratefully acid juice, and its flavour is altogether very pleasant, though different from that of most if not of all our other species.

R. saxatilis, L. Very rare. By the Plymouth and Dartmoor "tramway" at Common Wood.

The places mentioned in the preceding paper are in Devon, unless the contrary is stated. With the exception of one or two stations named for *R. Idæus*, L., all are within fifteen miles of Plymouth; and by far the greater number are considerably nearer this town.

4, *Portland Villas, Plymouth, January* 9, 1869.

NOTE ON *PANICUM MANDSHURICUM*, *Maxim.*

By H. F. Hance, Ph.D., etc.

The grass which, under the name of *Panicum Williamsii*, (Ann. Sc. Nat. 5me. sér. v. 250), I dedicated to my esteemed correspondent, Dr. S. Wells Williams, at present United States' *chargé d'affaires* at Peking, proves, on comparison with a specimen gathered by M. Maximowicz himself on the river Schilka, to be identical with the typical form of the above-mentioned species, which I also possess from Jehol, from Père David. Though I have long had from Dr. Williams the variety *Pekinense*, Maxim., which I had no difficulty in determining, it is so unlike the typical form in appearance, with its hirsute vaginæ and short whorled panicle-branches, with crowded small spikelets, that I never even suspected their specific identity, nor should I probably have done so now, but for my recognition of that of the Schilka plant, with the smooth, long-panicled one from Peking and Jehol. In illustration of the extreme difficulty of deciding on affinity in this most intricate of grass-genera, I may notice that M. Maximowicz, characterizing *P. Mandshuricum* as very distinct, believed its nearest allies to be *P. amarum*, Ell., and some other North American species, whilst I was myself disposed to consider it akin to *P. excurrens*, Trin. My friend Dr. Thwaites, on the other hand, to whom I sent a specimen, wrote to me that it was "very closely allied to, if not a form of *P. leptochloa*, Nees." Though I do not doubt its claim to specific rank, I am equally satisfied that the judgment of Dr. Thwaites as to its relationship is more correct than that of either its accomplished discoverer or of myself.

NOTE ON THE *CAPPARIS MAGNA*, OF LOUREIRO.

By H. F. Hance, Ph.D., etc.

In a small collection of plants made in the interior of the island of Haenan, in March last, by Mr. Robert Swinhoe, and submitted by that gentleman for my examination, amongst which I may mention as remarkable the rare *Harrisonia Bennettii*, Benth. and Hook. fil.,*

* I find in this plant the staminal scales quite entire, as figured by Bennett (Pl. Jav. Rar. t. 42); not bifid, as described in the 'Genera Plantarum:' the flowers have sometimes six petals and twelve stamens.

(= *Lasiolepis paucijuga*, Bennett), hitherto recorded only from Java and the Philippines, there occurred one or two good specimens of the *Capparis magna*, of Loureiro, rightly referred by De Candolle to the genus *Cratæva*. It is evident, however, from the character assigned by Wight and Arnott to Hamilton's *C. Nurvala*, that this is the same plant. De Candolle's name of *C. magna* was published in 1824, in the first volume of the 'Prodromus,' and has therefore, I believe, two years' priority over that of Hamilton, given in the fifteenth volume of the 'Linnean Transactions,' which it must of course supersede.

NOTE ON *THESIUM DECURRENS*, *Bl.*, AND *T. CHINENSE*, *Turcz.*

BY H. F. HANCE, PH.D., ETC.

Professor Miquel, in his 'Prolusio Floræ Japonicæ' (Ann. Mus. Lugd.-Bat. iii. 132), records both of the above species from Japan, referring to the former Maximowicz's Yokohama specimens, and to the latter those gathered by Oldham at Nagasaki, and distributed under n. 659, and adding "Superiori omnino simile, sed perigonii pars libera brevior, ejusque pars indivisa in flore lobos æquans; hi in fructu sistunt coronulam apice vix inflexam brevem (breviorem quam in superiore), in illo dein partim involutam; bracteolæ (quæ vero in superiore etiam variabiles), multo breviores, nuce depresso-globosa breviores." Both of these plants are now before me; the first sent me from Yokohama by M. Maximowicz himself, and labelled "*T. decurrens*, Bl., ? *β. longibracteatum*, A. De Cand.," the latter from Kew, with the above-mentioned number and Turczaninow's name with a ? prefixed. From a very careful comparison of these, I am quite satisfied that they are both in flower and fruit in every respect identical, and that no dependence can be placed on the characters on which Miquel relies for their distinction, which in fact do not hold good in my specimens. And not only so, but they are both undistinguishable from a very fine specimen gathered in sandy places around Jehol, for which I am indebted to Father Armand David, and which is unquestionably referable to Turczaninow's species. Nor do I see any characters to separate a plant sent me from Tam-suy in the island of Formosa, by the

late Mr. Oldham, though the perigone-lobes in the only ripe fruit seem somewhat deeper cut and more involute; but in all I possess, while the bracts are very long, the relative length of the bracteoles is subject to considerable variation, even on the same specimens. In none that I have examined, however, can I find a quinquefid perigone, the lower free portion in all cases equalling, or nearly so the lobes. And if the differences in this respect relied on by Miquel are inconstant, and there seems little or nothing else in the diagnosis of Alph. De Candolle to distinguish the two species, though he makes the depth of division of perigone-lobes a sub-paragraphic character, it may be open to question whether they should not be united. If the plant taken by Miquel for *T. decurrens*, be really identical with that of A. De Candolle, I cannot doubt that such must be done.

ON THE ECONOMICAL VALUE AND APPLICATIONS OF THE LEAF-FIBRE OF NEW ZEALAND FLAX (*PHORMIUM TENAX*, *Forst.*).

By W. Lauder Lindsay, M.D., F.R.S.E., F.L.S., etc.

(*Concluded from p.* 31.)

Some years ago, at a time when there was considerable agitation in Britain, on the subject of scarcity and dearness of paper in the European market, and when the 'Times' had offered a premium of £1000 to any enterprising experimentalist, who should introduce a new marketable material,—a successful competitor (especially as regards price) to rags, I was led to study the subject of "substitutes for paper material." My inquiries brought me into correspondence with Charles Cowan, M.P., of Valleyfield Paper Mills, and Robert Craig, of Newbattle Paper Mills, both near Edinburgh; R. M. Cameron, editor of the 'Paper Trade Review;' Thomas Routledge, of the Ford Paper Works, near Sunderland,—the introducer of "esparto;"* P. L. Simmonds, author of works on 'Waste Products,' and the 'Commercial Products of the Vegetable Kingdom;' the late Professor

* Mr. Routledge writes me (March, 1866), that his sales of "esparto," during the preceding year, had been over 30,000 tons. No other material is used in the Ford Works, and it is now also largely used by almost every paper manufacturer in Scotland.

Henslow, of Cambridge; Dr. Hooker, of Kew; M. C. Cooke, of the India Museum, and other eminent authorities on paper manufacture, or paper material. Among other results I was somewhat surprised to find that the amount of non-utilized material, quite equal in value, I believe, to New Zealand flax as paper stuff, is enormous. Fibres suitable for paper-making, as well as for the manufacture of cordage and textile fabrics, abound in all parts of the world, that are characterized to any extent by higher vegetation, especially in all tropical, warm, or temperate climates. Many of the British Colonies are hence most prolific, especially the East and West Indies, Mauritius, and Natal. All these colonies, however, have this advantage over New Zealand, that labour is abundant and cheap,—that of negroes, coolies, Kaffirs,* or other natives of the tropics, being largely available in all of them. These colonies are, besides, nearer England, and they have many other advantages over a distant young colony. From all which it follows, that there is little likelihood, I fear, of New Zealand flax competing with other fibres as a paper material, unless in the local market.

Other Economical Applications of the Fibre.—In the New Zealand Exhibition of 1865 there was shown a complete series of flax-made fabrics from the coarsest to the finest, including railway cloths, sail cloth, canvas, duck, twill for cavalry trousers, and cambric; but such specimens have a very limited value; they show what can be made of New Zealand flax, under certain exceptionable circumstances, but they do not exhibit the cost of production. In point of fact, such specimens can only be regarded as "fancy" articles "got up" for exhibition,—mere curiosities of local ingenuity and industry. They have been, for the most part, manufactured with great care from fibre dressed with great labour and at great cost. Articles similar to the samples could not be produced at prices nearly equal to those of jute or hemp. Briant regards New Zealand flax as suitable for coarse bagging, corn-sacks, wool-sheets and bands, hop-bags, and similar articles, which, however, in this country at least, can be made infinitely more cheaply from jute, even though the latter is itself at present somewhat dear. The "tow," or refuse flax, from cordage-making (in the form of an awled fibre like "corn") has been found suitable for stuffing mat-

* In the south island of New Zealand there are very few natives, about 2200, in Otago only 500, and in the north, where there are still 53,000, their labour is much more valuable than that of negroes or coolies.

tresses, sofas, and chairs; and for this purpose it has been largely used in the North, and is also coming into use in the South Island. It has been found to preserve its elasticity for ten years. The fibre, or "prepared leaf," is used by the Otago settlers for caulking canoes and boats (coples). In the North Island especially, the fibre is still, to a considerable extent, manufactured by the natives into rugs, floor-mats, cloaks, and other articles of dress, or house furnishings, which are used equally by settlers and Maoris.

Properties and applications of other products and parts of the New Zealand Flax plants.—The foregoing do not by any means represent all the economical applications of this most useful plant. Indeed, in pre-colonization times especially, it was to the Maoris what the Cocoa-Nut Palm is to the Singalese and Pacific Islanders, the Bamboo to the Chinese, or the *Thuja gigantea* to the Indians of British Columbia and Vancouver.

The green leaf, torn into strips of varying size, subserves an infinity of uses, in lieu of cordage especially.

The shafts of the gold mines in some of the Otago diggings are built by a method "as instructive as it is novel, consisting of a framework or skeleton lining of timber, interlaced or plaited vertically and horizontally with New Zealand Flax."* The timber used is the small or "scrub" timber, in many places comparatively abundant, and hence inexpensive. The flax leaf not only binds together the timber supports, but prevents the loose or "detached stuff" from falling on the miners while at work. With thongs of the same kind, in pre-colonization times, the Maoris lashed together the framework of their whevés and the palisades of their pahs. The settlers of the present day use strips of the leaf—of various breadth, according to the strength desired—in lieu of all forms of thong and cordage, straps, or other fastenings, *e.g.* as stock-whips, ropes, straps for conveying loads on the back, after the fashion of knapsacks (these flax-straps being known to the Maoris as "kĕhaki," or "kawe"). The drayman, or stockman, as he goes along, improvises the strong pliant fibre of the green leaf into a variety of useful articles; and I have myself, in the form of flax-straps and in other shapes, repeatedly experienced its utility. The Maoris make baskets, or "kits," of the split leaves, dyeing them with "hirau" or "inau" bark (*Elæocarpus dentatus*, Vahl). These

* Vincent Pyke: Gold Fields' Report for 1863.

native-made baskets are in great demand among the settlers. About Auckland I saw them constantly in use for the conveyance of fruit and vegetables, especially of the peaches,* which are there so common in Maori cultivations. The generic name of the New Zealand Flax plant—"*Phormium*"—is said to be derived from this economical application of its leaf, viz. φορμὸς, a wicker basket, but the same term signifies also a mat, and a seaman's cloak made of coarse plaited stuff; so that, as regards the economical applications of the plant products, the generic name seems to have been appropriately chosen.

The dried flowering stem is not only largely used both by settlers and Maoris for walking-sticks (I have so used it myself), but it was at one time commonly used by the Maoris in the construction of rafts,—known to the South Island native as "mokihi"† (Haast),—especially in localities where large forest-timber for canoe construction was absent. In the Chatham Islands, where there is now no such timber, flax-stems are still so used, lashed together by thongs of flax-leaf or by "bush-ropes"‡ of some kind. Rafts, or canoes, or "catamarans," are still occasionally improvised by travellers or explorers in primitive parts of New Zealand, *e. g.* by Haast, who reports constructing "catamarans" of dead trees when flax-sticks were not obtainable. The same dried flowering stems are still employed by the Otago Maoris in the construction of eel-pots ("punga") for snaring eels in the larger rivers. I remember accompanying my friend Mr. Shaw, of Finegand, to a Maori village on the lower Clithe, for the purpose of giving an order for the construction of a couple of eel-pots. The wooden war-clubs of the Maoris were occasionally ornamented with dyed flax. The essential feature of the "taupe" mat was flax strips, dyed, but not otherwise prepared; it was held in great estimation as being quite impervious to rain.

A gummy or gluey matter pervades the plant,—most abundant, however, at certain times and in certain parts. It exudes naturally from the cut leaves, and is also artificially separable. The settlers de-

* Ripe in February, 1862; the usual substitute there for apples in tarts and stews.

† Williams defines "moki" (or "mokihi," East Cape dialect), as a "canoe made of 'flags' or 'rushes';" so that other materials than flax-sticks (though their exact character does not here appear) are sometimes apparently also used in their construction.

‡ Climbers or creepers on forest trees; species of *Rhizogonum, Parsonsia, Rubus, Pleyianthus, Metrosideros, Clematis.*

scribe it as secreted by the base of the leaf (or leaf-sheath), and it was certainly there that I found it myself in any quantity. The gum in question resembles gum arabic in some of its properties, and as a substitute, therefore, it is used by the settlers.

It becomes invested with a high degree of interest in connection with the preparation of the flax fibre; for to it all testimony has hitherto concurred in ascribing the main difficulty in the separation and utilization of the latter. This gum also bears the reputation, in some parts of the colony, of being poisonous to cattle.* Were the New Zealand Flax plant extensively cultivated for the sake of its fibre, it is probable this gum might be separated and utilized.

The flowers secrete a watery honey, a familiar dainty of the settlers of all ages, of some of which I have frequently partaken while wading in the flax-jungles of Otago. On the first evolution of the flower, the large tubular perianth is found full to the brim of a clear, sweet fluid; at the same time the anthers are most copiously discharging their pollen,—so that the faces of the juveniles or adults who drain the flower-cups by direct application of their lips, generally bear the marks of that procedure in the yellow pollen-dust which adheres to their eyebrows, or besmears their faces. The plant contains 1 to 1¼ per cent. of Grape sugar, as well as a pure intense bitter principle; and these, when a strong infusion is subjected to fermentation (additional sugar being supplied) with yeast, yield a kind of bitter beer (Skey).† The bitter principle, the same chemist further suggests, might be used as a substitute for hops in communicating a bitter flavour to ordinary beer.‡

The root is said to be purgative, diuretic, sudorific, expectorant, and to possess the properties of sarsaparilla (Buchanan). So lately as December, 1862, I find it recorded in the 'Tarawaki Herald,' that for a virulent epidemic of smallpox at Kawhia on the west coast of Auckland, and Mokan in Taranaki, the native doctors were using with success an ointment made by boiling the root-ends of flax leaves to a pulp. The seeds, also, are said to have been used medicinally by the natives.

* *Vide* my paper on "The Toot Plant and Poison of New Zealand," Brit. and For. Medico-Chirurg. Review, July, 1865, p. 176.

† Jurors' Reports of the New Zealand Exhibition of 1865, p. 433.

‡ Ibid.

NEW BRITISH LICHENS.

By the Rev. James Crombie, M.A., F.G.S.

No. I.

Amongst many rare and previously undetected British Lichens met with in the course of my botanical rambles, during the last three years, the following *new* species have rewarded my researches. They have, with one exception, been named by Dr. Nylander, of Paris, and have been duly recorded by him in the 'Flora' for 1868. As several of them are from well-known localities, such as Ben Lawers and the New Forest, which have been repeatedly searched by some of our ablest Lichenologists, it is evident that Great Britain is still far from being exhausted, and that many hitherto undescribed species will be detected on further investigation.

1. *Pyrenopsis homœopsis*, Nyl.; thallus brown, thin, effuse, subgranulose; apothecia concolorous, lecanorine, small epithecium colourless, paraphyses slender; spores 0·011–18 mm. broad, 0·007–10 mm. thick; hymeneal gelatine reddish wine-coloured or yellowish wine-coloured with iodine.

On micaceous boulders above Loch-na-Cat on Ben Lawers. August, 1867. Apparently very rare, and seen by us only in small quantity. It is allied to *P. grumulifera*, Nyl., a Scandinavian species, from which it is sufficiently distinguished by the above characteristics.

2. *Lecidea subturgidula*, Nyl.; thallus greenish-white, very thin, effuse; apothecia more or less livid, opaque, convex, small, immarginate, hypothecium brownish; spores 8 in thecæ, colourless, oblong, simple or slightly 1–3-septate, 0·008–14 mm. long, 0·003–4 mm. thick, paraphyses not discrete, epithecium yellowish-white; hymeneal gelatine blue, and then yellowish with iodine.

On the decaying wood of an old decorticated Holly in the New Forest, near Lyndhurst Railway Hotel. May, 1868. Very rare, and found sparingly only on a single tree, notwithstanding a somewhat extended search. Its systematic place is near to *L. apochrœella*, Nyl., a species not yet detected in Britain.

3. *L. mæstula*, Nyl.; thallus greyish, thin, depressed, subgranulate or evanescent; apothecia black, minute, plane or convex, numerous and crowded, usually immarginate, colourless within; spores 8 in

thecæ, colourless, elliptical, simple, 0·007–8 mm. long, 0·0025–35 mm. thick, paraphyses not discrete, epithecium colourless or obscure, hypothecium obscurely brown throughout; hymeneal gelatine wine-red with iodine.

On old rails in the New Forest, near Lyndhurst, on the road to Menstrie. September, 1866. Abundant, and likely to occur elsewhere in that neighbourhood. It is allied to *L. myriocarpoides*, Nyl., and approaches also to *L. dispansa*, Nyl., and *L. turgidula*, Fries.

4. *L. leptostigma*, Nyl.; thallus (if proper) dirty white, rimulose; apothecia brownish-black, innate, small, gregarious; spores 8 in thecæ, globose or ellipsoid, uniseriate, 0·005–9 mm. in diameter, paraphyses of medium thickness, hypothecium scarcely yellowish; hymeneal gelatine not coloured with iodine.

On a micaceous weathered boulder, near Loch-na-Cat, on Ben Lawers. August, 1867. Apparently extremely rare, and gathered only very sparingly. It is allied to *L. resinæ*, Fries, and *L. tantilla*, Nyl.; all three British species being with difficulty separated from the Fungi.

5. *L. mesotropa*, Nyl. in Flora, 1867, p. 328; thallus greyish, verrucoso-areolate, indeterminate, of medium thickness; apothecia brownish-black or black, opaque, somewhat plane, adnate, the margin obtuse or evanescent, white within; spores 8 in thecæ, ellipsoid, 0·009–13 mm. long, 0·005 6 mm. thick; paraphyses slender, usually not discrete, apothecium brownish, hypothecium colourless; hymeneal gelatine blue with iodine.

On a gneissic boulder on the descent from Ben Lomond to Loch Ard. August, 1865. Probably not unfrequent in Highland districts, though not found by me since. It belongs to *L. contigua*, Fries, and its allies, with which, unless the spores are examined, it may readily be confounded.

6. *L. Crombiei*, Jones; thallus greenish sulphur-coloured, of medium thickness, unequal, rimoso-diffractate or subareolate, limited by the black hypothallus, which is everywhere visible between the areolæ; apothecia black, of medium size, innate, somewhat convex, immarginate, obscurely greyish within; spores 8 in thecæ, colourless, elliptical, 0·010–12 mm. long, 0·006–7 mm. thick, apothecium bluish-black, paraphyses not well discrete, hypothecium colourless or faintly reddish; hymeneal gelatine blue with iodine.

On serpentine rocks of the Khoil, in Braemar. July, 1865. This species was first distinguished as such by the late Admiral Jones, was subsequently gathered by Mr. Carroll, on Mangerton, in Ireland, and last autumn was again found by me in pretty fair quantity on the Khoil, and also sparingly on schistose boulders in Glen Callater. Its systematic place is intermediate between the preceding and *L. theiodes*, Sommerf., which may also occur in the Grampians.

7. *L. postuma*, Nyl.; thallus greyish, thin, evanescent; apothecia black, minute, plane, margined, concolorous within; spores 6–8 in thecæ colourless or brownish, elliptical-oblong, 3-septate, 0·015–16 mm. long, 0·006–7 mm. thick, epithecium and hypothecium brownish; hymeneal gelatine deep blue with iodine.

On calcareous stones, in gravelly places near the summit of Morrone, in Braemar. July, 1865. Probably not very rare, though but a single specimen was then gathered. It approaches very closely to *L. petræa*, Flot., of which it perhaps ranks only as a subspecies.

8. *Rimularia limborina*, Nyl.; thallus greyish, thin, rimulose or subareolate; apothecia black or brownish-black, rugulose, somewhat depresso-convex, roundish, depressed in the centre and radiately fissured, greyish within; spores 8 in thecæ, colourless, at length brownish, elliptical, simple, 0·018–25 mm. long, 0·011–16 mm. thick, paraphyses slender, irregular and often branched, perithecium black above, brownish-black below; hymeneal gelatine tawny-red with iodine.

On weathered calcareous stones on Craig Guie, Braemar. August, 1865. This new genus and species is described by Nylander from a specimen gathered, about the same time as my own, by Ripart in Haute Vienne. It is allied to the genus *Mycoporus*, and along with it may be considered as constituting a separate tribe, which Nylander proposes to call *Peridiei*. Further research may discover this lichen elsewhere in mountainous regions.

Besides these I have also met with the following *new* forms of other Lichens, viz.:—

1. *Parmelia lanata*, var. *subciliata*, Nyl., "with the thalline laciniæ and apothecia ciliated at margins."—On limestone rocks of Morrone, in Braemar, rare. 2. *Lecanora varia*, var. *symmicta*, f. *livescens*, Nyl., with small livid apothecia.—On old trunks of trees, at High Beech, Epping Forest, sparingly. 3. *Verrucaria cinerella*, var. *megaspora*,

Nyl., "with spores 0·023–36 mm. long, 0·009–13 mm. thick."—On bark of Hollies in New Forest, perhaps not unfrequent.

JAMES BACKHOUSE.

We have, this month, to mourn the loss of one of our veteran British botanists, a keen field-observer at home during nearly sixty years, and one of the pioneers in the exploration of our southern colonies,—Mr. James Backhouse, of York, who died at his residence, Holgate House, in the suburbs of that city, on the 20th of January, at the age of seventy-four.

He belonged to a family well known in Durham and the neighbouring counties, during several generations, as members of the Society of Friends, and for the prominent part they have taken in promoting the commercial prosperity of that now thriving district, three of the centres of which are amongst the newly enfranchised parliamentary boroughs,—the one to which Mr. Backhouse belonged, Darlington, having returned a member of his family as its first representative. Under the encouragement of his relative, Edward Robson, known as a correspondent of Sir J. E. Smith, he and his brothers learned, when very young, to take an interest in the plants of their neighbourhood, and formed a herbarium. He was apprenticed to a chemist and druggist in Darlington, but a severe cold, caught whilst distilling Mint, developed into pulmonary consumption, and for some time his life was despaired of, but by complete cessation from work, change of air, and a lengthened stay with a relative in a healthy country district, this was fortunately arrested. Left too delicate to follow any sedentary occupation, his love of botany led him to gardening, and he went to learn his business at Norwich, and stayed there a year or two. Here he made the acquaintance of Sir William Hooker, and sometimes shared his botanical rambles, as on an occasion of which we have heard him tell when they went to seek *Hippophaë*, near Cromer, and forgot to take any sandwiches, and had great difficulty in getting anything to eat and drink.

Between 1820 and 1830 he married, and began business at York as a nurseryman, in partnership with one of his brothers, and he considered the old cathedral city as his home for the rest of his life. He gradually began to take an active part as a volunteer minister in the

religious body to which he belonged, often travelling from home fo religious work, at first principally through the thinly-populated agricultural parts of Yorkshire and the neighbouring counties. In 1831, he undertook an extensive missionary tour, in company with a companion, which occupied him altogether more than ten years. First they visited Australia, where they remained seven years. The scope of their journey, as he explains in his published account of it, was primarily to preach everywhere where there was an opportunity amongst the colonists and convicts; to visit the penal settlements, gaols, schools, and other public institutions, to see in what state they were, and what improvements they needed, to do all that lay in their power to advocate a humane treatment of the residue of the aborigines, and to promote the spread of teetotalism. The greater part of the seven years they spent in Tasmania and New South Wales, and then they visited Western Australia and Mauritius, and sailed for the Cape Colony, where they remained for three years, in the course of which they visited all the towns, and the villages and missionary stations in the interior, as far as Namaqua Land and the Orange River, travelling upwards of six thousand miles in wagons and on horseback. It would be altogether beyond our scope here to enter on any details of the way in which the travellers fulfilled the objects of their mission. Three large octavo volumes, amounting in aggregate to not less than two thousand pages, contain a complete account of what they saw and did, and what they attempted to do,—one devoted to Australia, the other to the Cape Colony, and the third to a biography of his companion in travel, which Mr. Backhouse wrote after the death of the latter, not many years ago. Suffice it to say, that with regard to penal discipline they gave their warm adhesion to the plans for its amelioration with which the names of Captain Maconochie and Sir John Franklin (who was then governor of Van Diemen's Land) are connected, and that a temperance society in Tasmania and a school for poor children, which they originated in Cape Town, still, after the lapse of nearly thirty years, remain in active operation, the latter supported by funds sent out annually from England. Of what Mr. Backhouse did for botany during his expedition, we cannot give a better idea than by a quotation from the introductory essay to Dr. Hooker's 'Flora Tasmanica,' and may adduce also the testimony of the gentleman to whose labours in the field that magnificent work was more than to those of any one else indebted.

Dr. Hooker writes as follows in his history of the exploration of the island:—"Mr. James Backhouse visited Australia in 1832, and spent there six years. The journey was undertaken, as his narrative informs us, 'solely for the purpose of discharging a religious duty,' but owing to his knowledge of botany, his connection with a fine horticultural establishment (The Nursery, York), and his love of observing and collecting, the results of his journey have proved extremely valuable, in a scientific point of view, and added much to our familiarity with Australian vegetation. Mr. Backhouse first landed at Hobarton, and then, and on two future occasions, visited numerous parts of Tasmania, on the Derwent and Clyde, Macquarie Harbour, Port Arthur, Spring Bay, various stations on the north coast, and in the mountainous interior. He also twice visited New South Wales, and made excursions to the Blue Mountains, Bathurst, Moreton Bay, Newcastle, Maitland, Port Macquarie, Illawarra, and Goulburn; and afterwards went to Port Phillip, Adelaide, King George's Sound, and Swan River. The journals of these various extensive journeys are extremely good, and though specially devoted to philanthropic objects, they omit no observations on natural history, and especially on botany, that their talented author considered might be worthy of such a record. Mr. Backhouse formed a considerable herbarium, and made copious manuscript notes (now in the Hookerian library) which he liberally gave where he thought they would be most useful."—Introductory Essay, 'Flora Tasmanica,' p. cxxv–vi.

The following is a memorandum attached to a specimen of *Blandfordia grandiflora*, gathered by Mr. Gunn, now in the Hookerian herbarium:—"Very abundant at Rocky Cape, where I collected it in full flower, December 16, 1836, and in fruit in February and 1st of March, 1837. Soil very poor, quartz sand, but it appears to like moisture to a moderate degree. I had hoped, and, indeed, do still, that this may be found different to the *B. nobilis*, and that you will confer the name of our friend James Backhouse on it. It could not bear a worthier. It is also intimately connected with my first acquaintance with that truly good and amiable man. In January, 1833, I first met Mr. Backhouse and his worthy companion and fellow-labourer, George W. Walker, at a farm of my brother's, about thirty-five miles west from Launceston. They were then on their way from the Hampshire and Surrey hills, with one horse between them, and asked me how far it

was to Westbury, where they purposed remaining for the night. In the course of a short conversation, I mentioned who I was, and that I was in search of a splendid liliaceous crimson flower, which had been described to me, and which I had not seen. Mr. Backhouse at once told me that it was the *Blandfordia*, and that he had found it abundantly on Rocky Cape, and also at Port Darcy. It at once led to a botanical conversation, and from that period till the present a warm friendship has existed between us. The little knowledge I possess I may say I derived solely from Mr. Backhouse, whose assistance I cannot sufficiently acknowledge. He added largely to my collections, as my specimens to you show, and his knowledge of the botany of this region surpasses by far that of all others, except, perhaps, the great Brown, for whom I have a profound veneration. I sincerely hope that one who has done so much, and who may indeed receive the praise for the little I have done, will not long be left without having his name given to some genus in this land, and it ought to be a genus of no insignificant character, one of the princes of the forest, like 178 (if not a *Fagus*), or some of the coniferous trees I found on the western mountains. His botanical knowledge is, however, one of the least remarkable traits in his character. His general goodness and amiability will long endear him to every inhabitant of these colonies, connected as he was with everything good, devoting his time to the cause of Christianity and temperance. I can only as one say that many of his words have sunk deep in my heart, and that I shall always cherish his name with the fondest recollection."

The genus selected by Sir Wm. Hooker to bear Mr. Backhouse's name was a fine Myrtaceous shrub, with curious conspicuous petal-like calyx-segments, gathered by himself in New South Wales, which is occasionally but not frequently grown in greenhouses. Professor Harvey (who, at the time of his visit to the Cape Colony, filled the office of treasurer to the colony) desired to join in standing sponsor for the name, and *Backhousia* was duly characterized, and figured at tab. 4133 of the 'Botanical Magazine;' up to the present time, three species have been discovered.

Mr. Backhouse returned to England in 1841, and his companion went back to Van Diemen's Land, and settled there till his death. During the twenty-seven years that intervened between his return from the Cape and his death, a large proportion of his time was spent in

religious work and travel, but his journeys never extended beyond Norway, where there is a considerable body of Friends, principally amongst the farmers and fishermen along the coast, whom he visited three times, and in whose welfare he took a warm interest. He lived at York, at first in the centre of the city; but afterwards, when the business firm, of which, through the death of his brother, he became the senior partner, purchased more extensive grounds on the south-west side of the city, he removed to the village of Holgate, in the immediate vicinity of their nurseries, and occupied there for many years the house that formerly belonged to Lindley Murray, the grammarian. At Holgate he and his son laid out upwards of a hundred acres of ground in such a way that their garden is one of the regular recognized attractions of York. They were amongst the first to build a large glazed fernhouse, in which the exotic species could be grown in the crevices of rock, and streams of water introduced. Latterly, they have paid special attention to the cultivation and importation of *Hymenophyllaceæ*, and have introduced a great many new species, and planned a special house for this beautiful tribe, ingeniously constructed like a natural cavern, glazed over the top, with graduated temperatures to accommodate the inhabitants of different latitudes. But their special *forte* has always been rockwork gardening and the culture of alpine plants, and we believe that their collection in this department has long been the finest in the country.

Mr. Backhouse was, in botany, entirely what we understand as a field, in contradistinction to a closet, botanist; and so far as we can remember, he never published a technical description of a genus or a species in his life. His special delight was in alpine plants. There is probably no one amongst British botanists who has explored more thoroughly the mountainous tracts of our own islands,—from Sutherland southward to Derbyshire and Snowdon, from the Whitby and Scarborough moors westward to Connemara,—than he and his son. For several years they interested themselves particularly in the genus *Hieracium*, which was very badly understood in England till they took it up,—collecting all the forms they encountered, and taking them home to cultivate; and Mr. James Backhouse, jun., duly published the result of their joint investigations in his 'Monograph of the British *Hieracia*,' which has been substantially adopted both by Babington and Syme. Upper Teesdale, which is easy of access from York, and

where we have probably a greater number of interesting alpine plants, including *Hieracia*, gathered together within a small space than anywhere else in Britain, was his favourite district for a holiday; and he was the discoverer, or one of the discoverers, of almost all the interesting plants that have been found there of late years,—as, for instance, *Arenaria uliginosa*, *Polygala uliginosa*, and *Viola arenaria*, all three of which were additions to the British flora.

In person, Mr. Backhouse was below the average stature, and his long flowing grey beard, worn since the date of his travels, made him a man upon whom the eye fixed in a crowd. We are told that it was only by practice that he became fluent as a speaker, but that was before the time of our own knowledge of him. The great characteristics of his public addresses were earnestness and simplicity. He possessed a wonderful command of detail, and power of elucidating his ideas by apt illustrations and reminiscences; always clear, always practical, never aiming at ornament of style or soaring aloft to transcendental heights, or losing sight of the plain facts of life; in doctrinal theories as ready to maintain his own opinions as to respect the sincere convictions of others; skilful, when controversy became unprofitable, with his pithy common-sense and ready illustrative faculty to pour oil upon the troubled waters. In private life he always seemed equally at home with old and young, and with people of all grades of education and conditions of station; free, as few are free, from taint of dogmatism or worldliness or perversity or hastiness of temper, his unaffected sociability and geniality, and wide range of knowledge and sympathy, made his presence welcome wherever he came.

The following anecdote of a botanical excursion, in which the present writer was his only companion, is eminently characteristic. We went to stay for a few days at a little village in the centre of a tract of rocky hills which had never been searched botanically,—a hamlet of some two or three hundred inhabitants, so isolated that the post only came there twice a week; and when a plot of strawberries were planted there a few years before our visit, three-fourths of the inhabitants were quite ignorant of what the fruit was like. The landed proprietor was non-resident, and we found that the mines on which the inhabitants principally depended had been very unproductive for several years. The only place of worship was an Independent chapel, with the minister of which the religious and mental culture of the

population seemed to rest. Out of very scanty resources he had built a chapel and a school-house, and now he wished to establish a reading-room for the grown-up young men. We had an introduction to this minister, and called upon him the evening after our arrival, and talked about the village and its condition, and took his advice (and very good advice we found it) as to the best botanizing ground in the neighbourhood. After expressing his sympathy with him at parting, my companion said, "I hope thou wilt write and tell me how the reading-room goes on." That was all I knew at the time; but after a few years this minister died and his biography was published, and I read in his address at the opening of the reading-room the sequel of our conversation,—how that out of £118 which the room had cost. Mr. Backhouse had gathered and sent £45.

He kept his activity of body and mind scarcely impaired till past 70; but, after this, attacks of intermittent angina pectoris obliged him to restrict his jouneys, and incapacitated him from mountain-climbing. The last time we called upon him, about a year ago, though we found him very feeble in body, he was able to go with us round his garden, and was as interested and enthusiastic as of old in showing us his acquisitions, and was reading the Duke of Argyll's 'Reign of Law' with warm approbation, and writing out for a journal the notes which it suggested. Since, just after his return from the Cape, he at our first meeting laid his hand upon the head of the writer of this notice, then a little boy at school, with "Mind and get up to the top of the class; the finest apples always grow high up on the tree;" and a few years later encouraged him in botany at a time when he had no one else to encourage him, and gave him the first set of Highland plants which he possessed,—we have had the privilege of a continuous acquaintance with him; have stayed at his house, and received him as a guest at our own; have been lost with him in mountain mists, and stranded with him in the parlours of little country inns in pouring rain; have had his sympathy in times of rejoicing and misfortune; have heard him rivet the attention of crowded meetings in London by his words of earnest patriarchal authority, and rivet no less the attention of a roomful of rough uneducated Yorkshire men and women by his pithy anecdotes, with teetotalism as the moral of the story, and his shrewd straightforward common-sense. And we bear our testimony, now that he is gone, to his thoroughness and his consistency in all these so varied

spheres of life and labour,—a man who, through the years of a long life, devoted his best energies, with unflagging persistence, to the highest objects, whom none knew but to love, and none named but to praise.

J. G. B.

NEW PUBLICATIONS.

Flora of Devon and Cornwall. By J. W. N. Keys. Part 2: 1867. Part 3: 1868.

In our fourth volume, pp. 381–383, we noticed the first part of this Flora, which contained the Orders *Ranunculaceæ* to *Geraniaceæ*; in the present parts the enumeration is continued to the end of the *Compositæ*.

Several suggestions made in the above-mentioned review have been adopted by the author, and the two parts now under notice are in many respects considerable improvements on their predecessors. Many more local works are quoted, and the list of contributors is much increased; the arrangement of the localities has been altered for the better, and more care is taken in quoting authorities, though there is still room for improvement in this respect.

About 375 species are enumerated in these two parts, Babington's 'Manual' being the standard employed; there are, however, several doubtful natives, and probable errors of observation, included in this number.

A search through the ante-Linnæan authors would probably add a few more species to the Flora; *e. g.* a Cornwall locality for *Diotis maritima* is given by Ray in the first edition of his Catalogus Plant. Angliæ, p. 136.

We hope Mr. Keys will be able to finish his work; would it not be better to page continuously, instead of beginning a fresh paging with new parts as is done in Part 3?

En liten Proflit på Namnförbistring. By S. O. Lindberg. Helsingfors: 1867.

In this contribution to correct nomenclature its author does that justice to S. F. Gray, author of the 'Natural Arrangement of British Plants,' for one genus of *Hepaticæ*, which had already been done in

our pages (Vol. III. p. 297) by Mr. Carruthers for all the genera of that tribe. In his investigations, Dr. Lindberg discovered that *Blyttia* of Endlicher was identical with Gray's older genus *Pallavacinia*, and in accordance with the rule always acted on by botanists, he rejects the newer name. We notice that Milde approvingly refers to the correction in a recent number of 'Hedwigia,' but he seems to have overlooked the fact, that this correction had already been made in that very journal in an abstract of Mr. Carruthers's paper by Gottsche. It is true that Gottsche disapproved of accepting Gray's names, because of the numerous changes which their adoption would necessitate. The uniform practice must, however, in the end prevail, and future workers entering on the study of the *Hepaticæ*, without the prejudices in favour of the present nomenclature which must exist in the mind of one who has so largely formed it as Dr. Gottsche has, will restore the names of Gray, and accord to him that credit which is certainly his due, but which even the botanists of this generation seem very loath to bestow.

MEMORANDA.

Pinus Banksiana AND *Pinus rubra*.—It is remarkable that two of our most beautiful native trees, the names of which head this article, should not be in cultivation. On referring to botanical works, it is clear no one knows how beautiful they are. Of *Pinus Banksiana*, Dr. Gray says, "a low straggling bush or a small tree, from two to twenty feet high." Michaux, Nuttall, Richardson, Loudon, and others give about the same character of it. This is as much as may be said of it in the outskirts of its proper locality. Recently we had the opportunity of examining it through what we suppose the heart of its home. The woods between Lake Michigan and Lake Superior are mostly composed of *Pinus Banksiana*, and are generally from twenty to forty feet high,—at Escanauba we handled one which was probably sixty feet high and four and a half to five feet in circumference,—little inferior in height to a very fine specimen of *Pinus rubra* alongside of it. Richardson says, towards the North Pole the thickness of the trunk is out of usual proportion to the breadth of the branches. Not so here. The trunk had a very long tapering slender appearance as compared with the branches. Occasionally specimens would be seen standing by themselves; and nothing could be prettier than the slender straight stems, clothed with its slender feathering. We have nothing from Europe or Asia that would make a more beautiful ornamental tree than the Gray or Banksian Pine of this region. The Red Pine is very much like the Austrian in appearance. Growing in thick woods, no one can appreciate their beauty; but occasional specimens, standing by themselves, show that the

Red Pine is by no means inferior, if not much prettier, than the Austrian. We hope to see them some day generally grown.—*Meehan's Gardeners' Monthly* (*Philadelphia*).

Oblique Leaves.—In the volume of the Proceedings of the Boston Society of Natural History just published, Dr. Wilder shows that in the Elm the larger portion is in the upper or most elevated side,—the leaves not lying with their edges horizontally,—in the Hornbeam the outer or lower portion is the largest. De Candolle and Herbert Spencer have both tried to account for obliquity in leaves, but Dr. Wilder showed their reasoning insufficient. Dr. W. believed it to be caused by no external agency, but by an inherent constitutional force. Professor Agassiz remarked that German Botanists, especially Schimper and Braun, had long since investigated the development of leaves in connection with the general subject of phyllotaxis. They had found that each leaf was primarily a swelling or wave of growth, freeing itself from the axis of the embryo; and that differences in size between the sides of a leaf were caused by the greater force of the wave in its upward or downward descent. Such peculiarities as have been pointed out between the leaves of the Elm and Hop Hornbeam existed therefore in the earliest formation of the leaf, while yet connected with the axis by a broad base, and before any construction for the petiole had taken place. Professor Agassiz thought the word 'antistrophe' better expressed the inverse relation of corresponding parts on the opposite sides of a line than 'symmetry.' Dr. Wilder had shown that the corresponding leaves on each side of a shoot were symmetrical.—*Ibid.*

BOTANICAL NEWS.

At a recent meeting of the Botanical Society of Edinburgh, T. J. Bennett, Esq., F.R.S., of the British Museum, was elected one of its six British Honorary Fellows, and Professor W. P. Schimper, of Strasbourg, one of its Foreign Honorary Members.

The chair of botany in Trinity College, Dublin, vacant by the appointment of Professor Dickson to the similar chair in the University of Glasgow, has been bestowed on Dr. E. Perceval Wright by the Provost and Fellows of the College. Dr. Wright has for some years occupied the chair of zoology in the same college, and is favourably known by his researches in the animal kingdom. During the last illness of Professor Harvey, Dr. Wright discharged for him the duties of his chair. He has also written several memoirs on botanical subjects, and among the collections made by him during his recent visit to Seychelles were several interesting new plants, which he has described in the Transactions of the Royal Irish Academy.

Dr. T. C. Wyville Thomson, Professor of Natural History in Queen's College, Belfast, whose numerous memoirs on zoological subjects have made him extensively known among naturalists, has been appointed to the chair of botany in the College of Science at Stephen's Green, which was held along with the professorship in Trinity College by Dr. Dickson.

W. G. Smith, del. et lith.

Vincent Brooks, Day & Son Imp

NEW AND RARE BRITISH HYMENOMYCETOUS FUNGI.

By Worthington G. Smith, Esq., F.L.S.

(Plates LXXXIX. and XC.)

During the abnormal summer and autumn of last year (1868) a large number of new British species of hymenomycetous Fungi appeared in various parts of the country: of these several were noticed in this Journal at the time, while others remain at present undescribed. I select for illustration and description the following four species :—

Lactarius controversus, *Pers.;* stem stout, swollen, one or two inches long, sometimes eccentric, pruinose at the top, never marked with pits or depressions; gills decurrent with an obscure tooth; pileus fleshy, compact, rigid, convex, then depressed and subinfundibuliform, at first dry, but after rain viscid in all its parts, margin at first involute and villous; stem and pileus more or less covered with blood-red spots and smears; flesh very firm, like *L. piperatus*, Fr., milk white, unchangeable, plentiful. Odour faint, but pleasant, taste exceedingly acrid.

This noble addition to our Cryptogamic Flora was found by Dr. D. M. M'Cullough at and near Abergavenny, and forwarded through Dr. Bull, of Hereford, to the Exhibition of Fungi at the Royal Horticultural Society last autumn; the specimens sent to London grew under Poplars, about a mile and a half from Abergavenny; it also grew in great luxuriance (again with Poplars) at Abergavenny, forming a semicircle of some twenty feet in diameter. The specimens were crowded together in great numbers, and several attained a diameter of more than a foot; the specimen selected for illustration was one of the smallest, in order to get it on to the plate. In general appearance it considerably resembles several other *Lactarii*, as *L. vellereus*, Fr., and *L. insulus*, Fr., but it differs in many characters; it is highly acrid, and feels and looks soapy.

Polyporus sanguinolentus, *Fr.;* nodulose, then confluent, effused, soft, white, or cream-coloured, when touched becoming rosy brown; margin byssoid and fugitive; pores small, subrotund, unequal, at length torn.

This species, new to this country, I found growing in abundance on the perpendicular sides of a disused sawpit in Mr. Hebb's yard, Mild-

may Park, in August 1867. It grew upon naked clay, and on rotten wood in the last stage of decomposition, completely covering the four sides of the pit. Mr. Broome found it the following November on a wet bank in Epping Forest; its duration was short in the sawpit, and in neither locality has it since appeared.

AGARICUS (ENTOLOMA) JUBATUS, *Fr.;* stem fleshy, glossy, striate, and shining, white at the base, stuffed or hollow, clothed with minute sooty fibres; pileus fleshy, campanulate, at first acutely then obscurely umbonate, clothed with fibres, glossy, not hygrophanous; gills slightly adnexed, inclined to be ventricose.

This species was also shown at Kensington last autumn by Dr. Bull; he found it growing in great abundance on Merryhill Common, and in and near Haywood Forest, near Hereford, where I afterwards found it myself. It grew in dense clusters, some of them taking a circular form: young specimens are acutely campanulate, and full-grown plants attain a height of five or more inches, and a diameter of three or four; a small specimen is, however, selected for illustration to meet the restricted size of the plate. The taste is watery, and like many other pink-spored species, very disagreeable. I am not aware that this species has been before published as British, but I understand it was found by the Rev. M. J. Berkeley at Ascot, a year or two ago, and Mr. Currey informs me he found specimens on October 13, 1868, in a meadow adjoining a house called Twisden, between Goudhurst and Kilndown, in Sussex. Mr. Currey was kind enough to forward me several specimens which precisely correspond with the Hereford plants.

HYGROPHORUS CALYPTRÆFORMIS, *B. and Br.;* pileus thin, acutely conical, lobed below, minutely innato-fibrillose; stem white, smooth, slightly striate, hollow; gills rose-coloured, at length pallid, very narrow, acutely attenuated behind.—*Outlines of Fungology*, p. 202.

This distinct and beautiful species occurred in abundance in Holme Lacy Park last autumn, when the first specimens were gathered by J. Griffith Morris, Esq., during the excursion of the Woolhope Club; it grew amongst furze, and in open places bordering the plantations. As it has not been figured before, our Plate may perhaps lead to its detection elsewhere. It was first found, many years ago, by Mr. Broome, on Hanham Common, near Bristol, but the habitat is now destroyed, and the plant has disappeared from that district.

EXPLANATIONS OF PLATE LXXXIX.: Fig. 1, 2, 3, *Lactarius controversus*,

Pers.; 4, spores, × 700 diam.—PLATE XC.: Fig. 1, *Agaricus* (*Entoloma*) *jubatus*, Fr.; 2, section of ditto; 3, spores of ditto, × 700 diam.; 4, 5, *Hygrophorus calyptræformis*, B. and Br.; 6, section of ditto; 7, spores of ditto, × 700 diam.

NOTE ON THE GENUS *ARTHROSTYLIS*, *R. Br.*

BY H. F. HANCE, PH.D., ETC.

In the 'Flora Hongkongensis,' Mr. Bentham, following Brown, assigns to this genus all "the characters of *Rhynchospora*, except that there are no hypogynous bristles, and the style is articulate upon the ovary below the dilated base." I may remark, however, that both in the Singhalese *Arthrostylis filiformis*, Thw., and the Hongkong *A. Chinensis*, Benth., I find the squamæ distichously imbricate, as, indeed, they are described by Steudel (Synops. Pl. Cyper. 138), not imbricate all round, as in *Rhynchospora*. In this respect, therefore, the two genera stand towards each other in the same relation as *Fimbristylis* and *Abildgaardia*, which, on account of various transitions, Dr. Thwaites has, with his usual judgment, united; and it is certain that some *Rhynchosporæ* show a tendency to a bifarious arrangement of the scales. In the Ceylon species I can detect no hypogynous setæ; but they were certainly present and very conspicuous in all the flowers of the Hongkong one I examined some years back; and Mr. Sampson, who is a very careful and trustworthy observer, finds the same in specimens gathered by him last autumn, an observation I have myself verified. The instability of this character in very many genera of the Order is now, however, fully established, so that Parlatore, Asa Gray, and most other eminent modern botanists concur in the propriety of reducing *Isolepis* to *Scirpus*, the two merely differing by the absence or presence of these organs. Apart from the distichous arrangement of the squamæ, more or less observable, as just remarked, in some *Rhynchosporæ*, *Arthrostylis* differs from that genus by the style being, as in *Fimbristylis*, articulated below, instead of above the bulb-shaped base,—a distinction of small account morphologically, I think. On the other hand, I do not see that there is any single character by which it can be distinguished from *Schœnus* (including *Chætospora*), and in habit it is exceedingly like *S. ferrugineus*, L. I believe there is probably no single Order in which, in proportion to the number now universally admitted, so many of the genera will, on

a thorough revision, be found untenable, the characters relied on being either inconstant, or at most of merely sectional value, and the so-called genera being linked with each other by all kinds of gradations. Parlatore, who is by no means indisposed to recognize genera based on comparatively slight characters, provided these are constant, writing of those employed for the dismemberment of *Scirpus*, well observes,—"Genere immeritamente diviso in molti, fondati sopra caratteri falsi della presenza o mancanza delle sete del perigonio, dello stilo bifido o trifido, dell' achenio triangolare o schiacciato, caratteri tutti variabili in questa famiglia, non solo nelle specie di uno stesso genere, ma ancora negl' individui di una stessa specie, e fino nelle spighette di uno stesso individuo."

ON THE SEXUAL ORGANS OF THE CYCADACEÆ.

By F. A. W. Miquel.

(*Translated by* W. Thiselton-Dyer, *Esq.*, B.A., *from the author's French edition of the paper published in the 'Archives Néerlandaises,' t.* iii. 1868.)

In 1845, when I published some researches on the ovules, embryos, and male organs of the *Cycadaceæ* (Ann. des Sciences Nat. 3me série, t. iii. et iv.), Gottsche published in the 'Botanische Zeitung' an important investigation of the same subject. The results of these wholly independent researches were, in many points, identical; but Gottsche had taken a more comprehensive point of view by including the *Coniferæ* as well. At that time I had already completely abandoned the morphological views which I had previously published ('Monographia Cycadearum') on the axial nature of leaves, as well as Richard's theory of the ovule. Robert Brown, by his investigations of the genus *Pinus* ("On the Plurality and Development of the Embryos in the Seed of the *Coniferæ*," Annals of Nat. Hist., May, 1844), had ensured still more support for his theory of gymnospermous ovules first stated in 1826 (Appendix to Captain King's 'Voyage').*

It is well known how much the labours of Mirbel, Spach, Schleiden,

* Previously read at the British Association Meeting at Edinburgh. Robert Brown afterwards added a note, to the effect that the credit of the first idea of this theory does not belong to Mirbel; and he states that Aubert du Petit-Thouars had already noticed various points in the structure of the ovules of *Cycas*, without deducing from them the notion of gymnospermous ovules. (Histoire des Végét. des Iles d'Afrique.)

Schacht, and especially of Hofmeister, have cleared up the history of gymnospermous ovules, their mode of fertilization, and the development of the embryo. The *Cycadaceæ* only remain almost completely excluded from these investigations; and if this may be accounted for by the remoteness of the native country of these plants, and the rare occasions of their flowering in our botanic gardens, it is the more to be regretted, as their ovules are of the simplest form, and, from their size, the best adapted for examination.

Without treating the subject in detail, I propose to notice and discuss the reproductive organs of the *Cycadaceæ.* I adopt the morphological identity of ordinary leaves with the structures which bear the ovules and pollen as the basis of these remarks,—with this physiological distinction between the latter, that in *Cycas* the male organs, collected into a cone, arrest the terminal growth, like the male and female organs af all other *Cycadaceæ*, so that growth must be continued by lateral buds; while the ovule-bearing leaves in the same genus are collected into a large terminal tuft, in the centre of which is a leaf-bud. We have here the representative of a primitive type; structure and function reach their most simple expression; the ideal arrangement of the organs of reproduction, which has been established in the higher plants by the doctrine of metamorphosis, is realized in an actual example.

In comparing different genera of the *Cycadaceæ* with one another, it is easy to recognize the homology of the sexual apparatus. From the carpophyll of *Cycas*, which retains in every respect its leafy characters, there is a gradual passage, through *Dion** and *Macrozamia*, to the squamose and peltate organs of *Zamia* and other genera. The same thing holds good, as I have previously shown at greater length, with the male organs. The male and female cones, or the terminal tuft of carpophylls, each represent a single male or female flower, composed merely of the simplest sexual organs, anthers, and carpels.

While the homologous organs of plants often differ widely, both in their anatomical relation and in their external development, a definite anatomical resemblance may be traced in the *Cycadaceæ*. The carpo-

* Continental authors have been in the habit of quoting Lindley's genus *Dion* as having been thus spelled by error (Miq. Prod. Syst. Cyc. p. 22; "Dioon, Lindl. Bot. Reg. ubi Dion vocatur"; DC. Prod. xvi. 2, p. 537, "Dioon (errore Dion)" etc.): but he intentionally omitted one of the o's, and invariably wrote it Dion, and he has classical authority for thus contracting it.—Ed.

phylls (and also in many points the androphylls *) are composed of the same kinds of tissue as the leaves. Vascular bundles leaving the stem penetrate them in a semicircle, and following their longitudinal axis, pass parallel to one another through the petiole and midrib, curve outwards towards the segments of the barren laminæ in *Cycas*, and traverse each segment without dividing, exactly as they are distributed in the leaflets of the ordinary leaves. They turn in just the same way towards the point of insertion of the ovules into which they penetrate (Plate XCI. fig. 1. *C. revoluta*). An analogous arrangement of bundles, parallel in the petioles, and diverging at the upper part, occurs in the carpophylls of *Dion*, *Macrozamia*, *Encephalartos*, and *Zamia*; only in consequence of the contraction of the upper parts, and their conversion into large plates or shields, the bundles take a direction more curved, and are usually less developed. In all these genera the bundles which penetrate the ovules may be seen very distinctly.† More or less cylindrical in a transverse section, they exhibit at the exterior or posterior side a layer of liber-cells, on the opposite side woody tissue. Laticiferous canals are regularly distributed, and traverse the tissues just as in the leaves. Chlorophyll cells exist uniformly in the external layers of parenchyma when young. The epidermis presents no essential distinction, and the stomata which are deeply situated and have the appearance of little holes, are easily distinguished.

The morphological interpretation of the component parts of the ovule is not yet completely made out. Botany does not possess as yet any theory of the ovule which is generally adopted. The attempts which have been made to frame one, have been summed up with great clearness by Braun (‘Polyembryonie und Keimung von *Cœlobogyne*,’ 1860, p. 186). Braun himself was inclined to think that the coats might be regarded as developments from the funicle. Caspary (“Vergrünungen der Blüthe des Weisklees:” Physik. Œcon. Gesellsch. zu Königsberg, 2nd year) raised objections against his view, as well as against

* It is convenient to adopt this term instead of an expression like Lindley's “antheriferous cone-scales.”—W. T. D.

† I use the expression vascular bundles for what are only the equivalents of bundles composed of true vessels, for among the Cycads, as well as in vascular Cryptogams, only vascular cells, closed at the extremities, occur in the bundles. Among these cells, spiral, netted, scalariform, and porous varieties occur in Cycads. (On this lower type of vascular bundles see Caspary, “Ueber die Gefässbündel der Pflanzen,” in the ‘Monatsberichte der Berliner Akademie der Wissenschaften,’ July 10, 1862.)

that of Rossmann. According to this observer (Bot. Zeitung, 1855, p. 666) from the examination of a monstrous *Aquilegia*, the border of the carpellary leaf divides into as many lobes as there are funicles. These are the equivalents of the lobes, and bear the ovules which originate in the parenchyma of the lobes, but the nucleus is a new and distinct (*Neubildung*) production, giving rise also to the formation of the coats. According to this view, the coats would neither be a product nor a prolongation of the edges of the carpel. Brongniart had previously based on a monstrous *Delphinium* the following theory :—An ovule is the equivalent of a lobe or tooth of a leaf. The funicle with the raphe, as far as the chalaza, are formed by the vein of the lobe. The nucleus is an independent formation which makes its appearance on the upper surface of the lobe, but the coats are nothing more than the folded extremities of the lobe ("Lobe foliacé replié sur lui-même en formant une sorte de capuchon," Archives du Muséum d'Histoire Nat., iv. 1844). For anatropous ovules there is something seductive about this theory, but it leaves unexplained the existence of double coats, and does not determine the precise point from which the formation of the nucleus starts. The observations on which it rests as well as those of Wesmael (Bulletin de l'Académie de Bruxelles, xviii. p. 12) of the replacement of ovules by leaflets or leafy lobes, are of great value as arguments against the theory of axile placentas, but they do not at present appear to be able to supply an adequate explanation of the formation of the ovules themselves.*

The production of ovules on the edges or upper surface of carpellary leaves has been well compared to the formation of buds in the same positions on ordinary leaves,—a phenomenon which is far from being uncommon, either in cultivated or uncultivated plants, and which, considering the low differentiation of the tissues in the vegetable organism, is not very remarkable. The unintermitted production of a succession of buds and axes, which remain united, or separate as distinct individuals, is the essential character of all plants. Although as yet it has eluded direct observation, we can only picture to ourselves the formation of a bud as originating in a cell differentiated from neighbouring cells. In this cell therefore the bud, that is the new individual, is

* The observations of Marchand (Adansonia, iv. p. 159), and of Kirschleger (Pollichia, xxviii. p. 111), on ovules partly transformed into leaves, as well as those of Cramer, are only known to me from quotations.

already potentially determined. The final result of the formation of an ovule is the differentiation of one of the cells situated in its axis, which produces the new individual; in this way the embryo-sac is to a certain extent the equivalent of the parent-cell of the bud. The embryo-sac is fertilized by the absorption of matter contained in another cell which places itself in contact with it; and if we inquire the cause of the individualization of the parent-cell of a bud, it must be looked for also in the phenomena of nutrition, of which the adjacent parts are the seat. Modifications of the movements and distribution of the nutritive juices are the means of exciting the production of buds. The destruction of a terminal bud causes the production of numerous lateral ones. Incisions, by accumulating the supply of food at particular points (of a leaf or root, for example) cause the production of buds there. The ovule is usually considered as distinct from the carpel, and the line of separation drawn at the origin of the funicle; but would it not be more philosophical to regard it as a stage in the development of a particular part of the carpel, and to look upon the embryo-sac alone as a new and independent structure?

The search amongst monstrous structures for the key to the true meaning of the parts of the ovule is a proceeding which encounters serious difficulties in the circumstance that the parts are very frequently so altered in position and form as to be scarcely recognizable with sufficient certainty. The normal organogeny of carpels and ovules, which has been chiefly studied in Angiosperms, supplies good information as to the external aspects of the phenomenon, and reveals to the eye its anatomical characters, but it will always be extremely difficult to penetrate in this way into the morphological interpretation of organs reduced to their minimum of development. Besides this, the complete history of the evolution of the leaf is still wanting; even after the admirable researches of Eichler, it has not been distinctly ascertained in all its bearings. Under these circumstances the consideration of the carpophylls of the *Cycadaceæ*, which are less modified by metamorphosis than the corresponding organs in all other Phanerogams, will perhaps supply some explanation as soon as their development has been completely studied,—a labour for which unhappily the materials cannot be obtained, except in the native country of the plants.

I have consequently confined myself to calling attention to the following points:—

1. In *Cycas* the vascular bundles of the carpophyll penetrate both the barren leaf-segment and the ovules in the same way (Plate XCI. fig. 1, *C. revoluta*).

2. The place where a leaf-segment should be developed is occupied by an ovule.*

3. The surface of the ovule is continuous with that of the carpophyll, and has the appearance of a lateral expansion of it. The same epidermis covers both.†

4. The leaf-segments of the sterile part are not entirely flat, but more or less swollen and cylindrical, which is an approach to the form of an ovule. This approach it is true is very slight, and the comparison between the hardened points of the segments and the hard summits of the ovules may also seem too forced. This comparison, however, adds greater value to a monstrous development of the carpophylls of *Cycas Rumphii*, which I have previously studied. In many of them all the ovules were replaced by long leaf-segments.‡ A carpophyll of the same flower, however, exhibited some ovules, but one of the sterile segments immediately succeeding the ovules was much more swollen than the others, and became hollow in its upper part.§ Moreover it was evident by making a section that the vascular bundle did not remain simply central, but divided a little above the base into several branches placed all round the axis, and not in the axis itself. All the other carpophylls exhibited deviations more or less distinct in the same direction, and I was mistaken in regarding these carpels as normal, and characteristic of one particular species. Connecting forms have since convinced me that it must be referred to *C. Rumphii* (as that species has been defined by me).

5. In all the species of *Cycas* the ovule is more or less flattened, being compressed parallel to the plane of the carpophyll, and having an upper and under surface. This character agrees with the arrangement of the vascular bundles, which are collected together on the two opposite sides of the external layer of the coat; when further developed, the internal woody layer is also seen to consist of two halves, united by lateral sutures, which in *C. Rumphii* even form two sharp

* See figure of *Cycas Rumphii* (Linnæa, xxv. tab. ii.).

† See Analecta Bot. Ind. ii. tab. iv., and figures of the carpophylls of *Cycas* generally, especially of *C. revoluta*.

‡ Linnæa, xxv. tab. ii. fig. 1.

§ *Loc. cit.* fig. 3, the first segment to the left, then regarded by me as normal.

edges. The same structure may be recognized in the biovular carpophylls of other *Cycadaceæ*, and we see that in them the flattened form gives rise to tetragonal forms in consequence of the opposing mutual pressures.

6. Anatomically the ovule resembles a thickened leaf-segment, in which the tissues are arranged round a centre instead of being drawn out in a plane.* I pointed out this homology in 1842 (Monog. p. 12), and Heinzel (Diss. de Macrozamia) has taken a similar view.

The external layers of the carpophyll are composed of parenchyma, becoming more merenchymatous in the interior. At the same time elongated cells with thickened walls frequently appear in this region.† The same arrangement of the tissues occurs in the coat of the ovule in every Cycad which I have examined. The two layers, as I have elsewhere shown,‡ and as is now generally admitted,§ form morphologically only a single coat. The external coat, which is filled with juices later on, is green when young, but frequently coloured red when mature. The internal layer represents the more prosenchymatous part of the carpophyll. It soon becomes woody, the points where afterwards what are called the sutures occur, becoming so last. The two layers are reduced to their least thickness in the tubular exostome at the summit;‖ both play a more or less important part in the formation of

* M. Casimir de Candolle in a recent paper on the theory of the leaf (Archives des Sciences, May, 1868, translated in 'Student,' Aug. 1868), considers leaves as branches with the side turned towards the axis undeveloped. The ovules of Cycads may be looked upon as reversions to a more complete structure of particular portions of the carpophyll.—W. T. D.

† As in other plants, it then anatomically diverges a little from the leaf (see above, and Kraus in Pringsheim's Jahrb. t. iv).

‡ "Structura *integumenti* peculiaris est, et ab illa ovulorum, qualia hucusque novimus, aliquomodo diversa. Inde ab initio offert:—

"1. *Stratum externum* carnosum, cellulis parenchymaticis regularibus conflatum, eadem epidermide ac carpophyllum vestitum . . . . , apex hujus strati tubulosus.

"2. *Stratum secundum*, ligneum vel osseo-ligneum, cellulis parenchymaticis et elongatis compositum, materia deposita inde a prima origine lignescentibus."

I quote this passage because an entirely different opinion has been recently attributed to me (C. A. J. A. Oudemans in Vers. en Meded. der Koninkl. Akad. vol. ii. p. 255, et Arch. Néerl. vol. ii. p. 395). The fact that the two layers are *entirely blended and are developed simultaneously* is sufficient to show the absurdity of regarding them as two distinct coats.

§ See Eichler in Martius, Flora Brasil., Coniferæ et Cycad. p. 410.

‖ M. Oudemans has called this part the micropyliferous tube; but as it does not form a distinct structure, it seems more correct to speak of it as a tubular exostome.

the exostome, and hence it often happens in ripe fruits that the summit of the woody part is prolonged into a tubular point.*

The vascular bundles, which are direct prolongations of one of the vascular bundles of the carpophyll, pass through the cellular layer nearly to the summit, and in ripe fruits are closely applied to the woody portion. They do not anastomose, and their number varies in different genera and species, but usually they are grouped, as has already been stated, on opposite sides. Frequently they leave impressions on the woody layer.

It seems, however, that in the formation of the coat all the tissues of the carpophyll are not equally developed. In *Cycas revoluta*, for example, and in the genera *Zamia* and *Encephalartos*, the epidermis is evidently continuous from one part to the other (Plate XCI. fig. 1); but in *C. Rumphii* the epidermis of the ovules is not densely hairy, like that of the carpophyll, and the ovules are surrounded at the base by a hairy ring, or cup-shaped dilatation of the carpophyll.† Up to what point the external layer of the coat is composed, on one side of a portion of the parenchyma of the carpellary leaf, and on the other of the whole, could only be determined when the development has been completely studied. From a superficial examination it might be surmised that the hairy cup of the ovule in the species belonging to the second division of the genus *Cycas* is of the same nature as the hairy surface of the ovules in *C. revoluta*. I have already (Analecta Bot. Indica, ii. p. 31) pointed out this distinction, which is not an unimportant one. But in using the terms *integumentum externum* and *internum*, I had no intention, in opposition to the opinion which I myself have expressed as to the simple structure of the coat, of distinguishing morphologically two distinct integuments. These expressions, possibly badly chosen, only apply to the external and internal layers.

I have already pointed out that the nucleus in Cycads is not developed before its coat, but contemporaneously with it.‡ I have never observed its first appearance. In the course of its development both it and the embryo-sac pass through very different stages, and I was

* (Plate XCI. fig. 4, 5.) This has also been stated by Karsten to be the case with *Zamia muricata*.

† See, amongst others, the figure of *C. Rumphii*, in Linnæa, xxv. tab. 2.

‡ Karsten has confirmed this point in *Zamia muricata*. The nucleus and its coat appear simultaneously. (Monatsb. Berlin. Akad., Dec. 18th, 1856.)

mistaken when I regarded (in the memoir quoted) the cavity of the embryo-sac, which soon loses its membrane, as formed by absorption and dilatation in the nucleus. The same error had already been committed by others in the case of the *Coniferæ*, and the point has only been cleared up by the researches of Pineau.

The free conical summit of the nucleus, in which I formerly looked for the embryo-sac, is situated above it, and rests upon its membrane. I considered as belonging to the nucleus a special vascular expansion formed of bundles which, after penetrating the ovules, rise above the external bundles, perforate the woody layer of the coat (producing the holes in its base; see Plate XCI. fig. 16), and distribute themselves, by ramifying and anastomosing, on the interior surface of the coat. They terminate above just at the point where the nucleus becomes free; it is consequently blended with the coat for two-thirds of its height. I had noticed this internal vascular system in all the *Cycadaceæ*, but it escaped my notice at first that it exists previous to fertilization. It has since been also made out in the *Coniferæ*.* Guided by analogy, I considered myself justified in terming it an expansion of the chalaza.† In the ripe fruits it appears much more distinctly; and when the remains of the nucleus which cover it are reduced to a thin membrane, as in *Macrozamia* and in a Cycad from New Holland, it is seen through it, and produces reticulated impressions on the surface of the endosperm. (Plate XCI. fig. 13 and 14, fig. 15 and 17; Plate XCII. fig. 11.)

As these ovules perforate the coat, and are situated between it and the enlarged part of the nucleus, it seems that they cannot be regarded as belonging to the coat. Heinzel (Diss. de Macrozamia) states that the vascular network is included between two membranes; but this view does not seem altogether accurate, since these cellular layers

* The analogue of these vascular bundles may be seen at the base of the nucleus in *Welwitschia* (Hooker 'On Welwitschia,' p. 33, tab. 9, fig. 11 and 12; Trans. Linn. Soc. vol. xxiv.). They become afterwards more developed (l. c. p. 37).

† Ann. des Sc. Nat. iii. p. 196. A vascular network which seems to be of the same nature has been observed more recently in some *Euphorbiaceæ*. A. Gris. has studied it carefully in *Ricinus*. He also adopts the name for it of expansion of the chalaza, and I am astonished that its resemblance to what exists in the Cycadean ovule has escaped his attention. Just as in it, the nucleus is united to the coat, which the endosperm in its enlargement reduces by compressio nto the state of a spongy membrane. (Ann. des Sc. Nat., sér. xv. p. 7; pl. ii. fig. 3.)

cannot be regarded as actual membranes existing as such originally. The outer one is intimately blended with the woody portion of the coat, and seems to form part of it; the inner is nothing more than the compressed remains of the nucleus, mentioned above, combined with what has been termed the epithelium of the nucleus. As soon as the embryo-sac is for the second time filled with cells for the formation, properly so called, of the albumen, and its cavity has attained in consequence a considerable enlargement, the tissues of the nucleus are pushed out and compressed in all directions, especially laterally, and transformed into a kind of membrane. This compression, in most of the species, is least towards the base; and in many of them, such as *C. Rumphii* and *C. sphærica*, a thick brown layer remains, on which the broad base of the albumen rests.

In *Macrozamia, Dion, Encephalartos*, and many species of *Zamia*, on the contrary, this layer is entirely converted even at the base of fruit into a sort of membrane (Plate XCI. fig. 15 and 17 c).* The degree of conversion is very variable in the same genus, and even in the same species, especially when the fruit has not been fertilized. In *C. angulata*, for example (Plate XCI. fig. 14 c), the layer is completely wasted by compression; in *C. revoluta* the enlargement which the cavity undergoes to make room for the endosperm takes place unequally, so that the tissues of the nucleus may be more or less preserved or effaced at the base. Modifications of the entire fruit result from this, and the fruit becomes ovoid, elliptical, or obovoid (Plate XCI. fig. 2-6). Generally speaking, this membrane (the remains of the nucleus which in its earliest stage is intimately united with the internal layer of the coat, but which gradually separates as this layer becomes woody) is so pressed by the dilation of the endosperm against the inner layer and the vascular network, that it can only be detached by maceration and boiling. In its earliest state, and in a living condition, it is often yellowish in colour. Later on, if still existing in sufficient quantity, it is brown when dry, and exhibits between the parenchymatous cells others of an elongated form.†

When the nuclear tissue has been removed in ripe seeds, the vas-

* Gottsche (l. c. p. 384) states that in *Encephalartos* a thin white membrane covers the vascular layer. Possibly there may have been in this case some of the cells of the first endosperm in addition.

† They suggest the spicular cells which Hooker has found in certain tissues of *Welwitschia.*

cular layer is not generally completely exposed; there still adheres an excessively thin layer of cellular tissue which may belong (as has been already stated) to the epithelial layer of the nucleus, or perhaps is formed of the first cells of the endosperm.

It is generally known that the nucleus of Cycads, which is more or less ovoid, is united for about two-thirds of its height with the coat, but that it terminates above in a free summit, which is more or less conical (Hooker calls it the *cone* in *Welwitschia*). This free portion is sometimes higher, sometimes shorter, but generally it is only slightly projecting at first, and rises as the nucleus grows, so as to have its summit sometimes immediately below the tubular exostome. Ordinarily conical in form, it is sometimes abbreviated, sometimes prolonged into a tube. When the endosperm increases in breadth, it is reduced to a lower level, but in the latter period of the formation of the seed, the endosperm pushes it completely upwards, and in this case it presents itself under an entirely different form. Near its base the cone is intimately united with the coat, the internal surface of which, where it is not united with the nucleus, is lined with a kind of epidermis, which ultimately forms a brown and smooth layer. Externally the cone is covered with a layer of dense cells (Schleiden's *epithelium of the nucleus*, Grundzüge, ii. p. 349; Gottsche's *covering of the nuclear protuberance*, l. c. p. 380). This becomes less distinct towards the base, on the part of the nucleus which is adherent to the coat, but may be recognised on the surface of the nucleus after boiling. Although this layer, at the point where the nucleus becomes free, is intimately united with the free internal surface of the coat, one cannot, especially when taking the independent existence of the nucleus into consideration, regard it as a continuation of the external epidermis; since there would thus be a structure in addition of which I know no other analogue.*

At the summit of the cone this layer rises a little above the internal tissue, and surrounds it like a ring (Plate XCI. fig. 7 *f*, and fig. 8 and 9). The apex of the summit which is not covered by this epithelium, and on which the pollen-grains fall to complete their development, and

* I must on this point differ advisedly from Oudemans (Archives Néerl. ii. p. 395). The point is more evident on comparing the ovules of Conifers; see for example, Schacht, Flora, o. Bot. Zeit. 1855, pl. ii. and the numerous figures which occur in the writings of Hofmeister.

which therefore performs the function of a stigma, is entirely naked, and secretes a viscous fluid. After a short period, the internal capacity of the cone is entirely filled with cellular tissue, which afterwards softens, and is partially reabsorbed. Mucilaginous channels (the paths taken by the pollen-tubes) are formed in it, which terminate below the wall of the embryo sac, in what have been called the areolæ, beneath which are situated the opercular rosettes of the corpuscles. (Plate XCI. fig. 12, 10 and 11, a section of the free summit in the direction of its length.) The upper wall of the embryo-sac being situated at the level where the nucleus becomes free, and where the base of the cone is solidly united to the coat, the cone is anatomically separate from the adherent portion of the nucleus, and as that becomes forced outwards and compressed by the dilatation of the endospermic cavity, this transverse separation becomes more and more distinct. Finally it withers, and it is afterwards found, particularly in fertilized fruits, applied as a cap on the top of the endosperm. In this condition it formerly received from some authors the very inexact names of *vitellus* or *scutellum*. (Plate XCI. fig. 13 *a*, Plate XCII. fig. 11.)

The history of the embryo-sac or amnios is very complicated, and it was not till after Hofmeister, Pineau (Annales des Sciences Nat., 3me série, ii. p. 83), and others had unravelled it in the *Coniferæ*, that I found it intelligible amongst the *Cycadaceæ*. The exact time of the first appearance of the embryo-sac I do not know, but it is quite certain that it takes place at a very early period in the existence of the ovule, and in the upper half of the adherent portion of the nucleus, termed by Hooker the *corpus nuclei*. From its first appearance, the cavity of the embryo-sac is filled with cells. At this period it is small and spherical, and its wall may be seen to consist of simple cellular membrane. I have only twice had the opportunity of examining it in this state, once in a *Cycas*, and once in a *Zamia*. The interior cellular tissue next disappears, and the cavity enlarges, and becomes filled with a mucilaginous fluid; from analogy with what takes place among *Coniferæ*, one would be led to believe that the period of fecundation approaches at this point. The second stage now commences, and as it is also completed in unfertilized ovules (fertilized ones have not yet been observed in botanic gardens), there is no reason for doubting that it is independent of fertilization. The free and rapid development of cells produces a highly developed albumino-plastic

tissue, a true endosperm. It is now no longer possible to distinguish the true wall of the embryo-sac; the space which it occupies is bounded by the dense, smooth, and shining surface of the dilated nuclear tissue, to which perhaps the *débris* of the original amniotic membrane adhere.* It is this which has previously led me into error, in regarding the embryo-sac as a free cavity in the albumen which I regarded as derived from the nucleus, so that I could not recognize the morphological meaning of the true nucleus, although I had observed figured and described the different stages of development. (Ann. des Sc. Nat. l. c. p. 199; Monogr. plate i. fig. R, S.) In numerous unfertilized seeds the endosperm occurred just as in those that were fertilized; to my great astonishment, however, I have observed several isolated cases where it was wanting, though the cavity for its reception existed.

I know nothing of the changes which take place in the upper part of the embryo-sac at the first appearance of the second endospermic formation, nor of the way in which the corpuscles of Brown originate. I only know the period at which the corpuscles already exist both in the unfertilized ovules and in the ripe seeds containing an embryo. The vault or upper part of the embryo-sac is very persistent, and becomes a soft pulpy, often yellowish membrane, to which adheres above, the internal tissue of the *conus nuclei*, below, the tops of the corpuscles.

Plate XCI. fig. 12 *b*, where the corpuscles do not yet exist; Plate XCII. fig. 9 *a*, the remains of the cone with the amniotic membrane adherent, below which are the corpuscles; fig. 10, the part removed with the corpuscles, which are attached to it; fig. 1, the embryo-sac with the cone removed and viewed from above, with the six areolæ or places where the interior canals of the cone terminate, and to which are attached on the opposite sides by their opercular rosettes the tops of the corpuscles;† fig. 2, tops of the corpuscles situated at this level; fig. 8, corpuscles whose tops exhibit regularly arranged fragments of tissue‡ (opercular rosettes (?) or shreds torn from the part where ad-

* Hooker has observed the same thing in 'Welwitschia,' *l. c.* p. 32.

† "Juniore ætate membrana tenuis mollissima fere gelatinosa saccos obtegit et eorum apicibus adhæret, punctis obscuris vel areolis parumper elevatis extus instructa, quæ cum saccorum subjacentium apicibus correspondent," etc. (Ann. des Sc. Nat. l. c.).

‡ "Fragmenta regularia, bases probabiliter canalium conductorum coni nuclei exhibentia." Description attached to plates.—W. T. D.

hesion exists with the amniotic membrane). At this point a total absorption of the membranes probably takes place, so that the pollen-tube can penetrate to the top of the corpuscles.

The unfertilized corpuscles at this time appear entirely filled with cellular tissue, or with a mass of protoplasm regularly divided by vacuoles. With respect to this I do not feel quite certain, but when the membrane is torn the included mass has pretty much the appearance represented in Plate XCII. fig. 5. I have found the same state in fertilized seeds which possess a normal embryo. It is probable that all the corpuscles which exhibit it (Plate XCII. fig. 4) have remained unfertilized; for I have always met with one or two at the same time, in which a small group of larger cells, from which the suspensor originates, could be observed free in the middle of the cavity. I imagine that this group at first occupies the base of the cavity, and that it is not till afterwards that it is elevated to a higher level by the pressure of the suspensor. It may be that this displacement has been simply the effect of the preparation which the object has undergone. The membrane of the corpuscles is relatively dense and resisting, and by transmitted light it seems composed of small cells with thick walls (Plate XCII. fig. 2 *a*, fig. 6, very much enlarged). I formerly stated that this was actually the case (Ann. des Sc. Nat. l. c. p. 198), and Gottsche held the same view (Bot. Zeit. 1845, p. 400), but we have really here what Schleiden has observed in the corpuscles of the *Coniferæ.* The external surface of the cellular membrane of the corpuscle is covered in its whole extent with a layer of very small cells, forming a kind of epithelium (Hofmeister, Vergleichende Untersuch. pl. 28 and 29). Gottsche has found the total thickness of the wall in *Macrozamia* to be 0·01 mm. In ripe seeds the corpuscles are situated in the upper part of the endosperm. They may be more or less flattened, sometimes free above, at other times attached to the lower surface of the areolæ. When the top of the nucleus or dried cone is torn off, the corpuscles usually follow with it, with the suspensors coiled upwards by the embryo. I have not been able to ascertain if the corpuscles are perforated at the summit. In those which I look upon as unfertilized, not a trace of opening can be seen. In those which have been fertilized, the fragments of cells which have been already spoken of (Plate XCII. fig. 8) are seen at the extremities. It is possible that amongst these *débris* a passage exists for the pollen-tubes. I have,

however, never met with any vestige of the tubes in the numerous seeds which I have examined.

(The Plates and the remainder of the Paper will be given in next number.)

VARIATIONS IN *EPIGÆA REPENS, Linn.*

(*Read before Philad. Acad. Natural Sciences, May*, 1868.)

By Thomas Meehan.

There are yet many botanists who regard variations as accidents. They speak of a normal form as something essential; and departures from their idea of a type, they refer to external causes, independent of any inherent power of change in the plant itself. Hence, when a change of form occurs to them, it is usually referred to shade, to sunlight, to an unusual season, situation, or some geological peculiarity of the soil. Cultivation is denounced as interfering with botanical science; introducing and originating innumerable forms, defying the skill of the botanist to classify or arrange. My experience in plant culture, and as an observer of plants in a state of nature, leads to the conclusion that there is no greater power to vary in the one case than in the other; that there is as much variation in the perfectly wild plant, as in those under the best gardener's skill. To illustrate this, I gathered a great number of specimens of *Antennaria plantaginifolia*, Hook., which, though I do not believe it has a greater average power of variation than any other plant, affords a good example for the following reasons:—The small seeds, I believe, require a clear surface of ground to vegetate, and young plants therefore never appear in a meadow or grassy place. In such positions plants only exist that had a footing in advance of the grass. They then propagate exclusively by runners. After being two or three years in this situation, they form patches of one or several square feet each. Now it is not easy to appreciate a minute difference between one single specimen and another; but when a score or more of specimens of one are matched against a similar number of the other, the minutiæ make an aggregate which is readily estimated. So we shall find in the case of a two or three year old meadow, filled with this plant, that

not only are *no two patches alike*, but that the eye convinces us of the fact on the first glance over the field. Plain as the differences thus presented were, I found, however, some difficulty in describing them in language; and besides being a diœcious plant, there might be brought in the objection of intercrossing between allied species of this or neighbouring genera, if not of the individuals of the opposite sexes themselves, to account for so many forms. I therefore chose *Epigæa*, as belonging to a Natural Order exclusively hermaphrodite; containing only one natural species; not very closely allied to any of the neighbouring genera, *Andromeda*, *Clethra*, *Gaultheria*, etc.; none of which, at any rate, flower at the same time with it.

On the 19th of April I gathered specimens from sixteen different plants on the Wissahickon, without taking any pains to make any particular selection of varieties. The following descriptions show their variations:—

1. Tube of the corolla half an inch long, contracted in the middle: segments of the corolla broadly ovate, one-third the length of the tube, incurved, pure white. Scales of the calyx two-thirds the length of the tube, narrowly lanceolate, interior ones white and membranaceous with a crimson base.

2. Tube half an inch, regularly cylindrical; segments half as long as the tube, triangularly ovate, light rose, incurved. Scales one-third the length of the tube, white coriaceous.

3. Tube quarter of an inch, thick (one-eighth wide), cylindrical; segments rather longer than the tube, triangularly ovate, incurved, deep rosy pink. Scales three-fourths the length of the tube, rosy red, with white margins.

4. Tube nearly half an inch, contracted at the summit; segments very short, scarcely one-sixteenth of an inch, forming nearly five ovate repand teeth, purplish-white. Scales greenish-white, simply acute.

5. Tube quarter of an inch long, one-eighth wide; segments lanceolate, erect, two-thirds as long as the tube, rosy purple. Scales brown, not margined, drawn out to a long fine point.

6. Tube quarter of an inch, cylindrical; segments oblong-ovate, recurved, as long as the tube. One of the anthers slightly petaloid. Scales prolonged into almost an awn.

7. Tube much narrowed at the summit, quarter of an inch long;

segments less than one-sixteenth of an inch long, pale purple. Scales greenish-brown, very narrow.

8. Tube near half an inch, contracted in the middle; segments quarter of an inch, linear lanceolate, bright rose. Scales half the length of the tube, broadly ovate, membranaceous, simply sharp-pointed.

9. Tube half an inch, cylindrical; segments quarter of an inch, of which there are but *three* broadly ovate, white.

10. Tube nearly three-quarters of an inch, cylindrical; segments quarter of an inch, narrowly ovate. Scales as long as the tube, linear-lanceolate, pale green.

11. Tube less than quarter of an inch, and shorter than the luxuriant foliaceous, mucronate scales. Segments of the corolla two-thirds as long as the tube, broadly ovate, pure white.

12. Tube quarter of an inch, increasing slightly in width upwardly (funnel-shaped), one-eighth thick at the top of the tube; segments short, ovate, reflexed, light pink. Scales longer than the tube, green, white margined.

13. Tube quarter of an inch, much contracted in the middle; segments quarter of an inch, broad ovate. Scales half the length of the tube, brown, with white margins.

14. Tube under half an inch, thick, perfectly cylindrical; segments quarter of an inch, broad linear, and rounded at the apex, waxy white. Scales quarter of an inch long, brown, with membranaceous margins.

15. Tube full three-quarters of an inch, cylindrical; segments quarter of an inch, triangularly ovate, pale rose. Scales half an inch, narrow and drawn out to an awn-like point.

16. Tube half an inch, cylindrical. Scales less than one-sixteenth of an inch, broad ovate, green, and barely pointed.

On again examining No. 12, after making these notes, I was surprised to find no trace of stamens, but with the pistil perfect; and on examining the other specimens, I found three out of the fifteen were pistillate also. Another remarkable fact was that all these pistils had the fine cleft stigmas strongly recurved, exposing a glutinous surface; while the hermaphrodite ones kept the apex of the pistils closed. The ovaries of the pistillate forms were also evidently better developed than those in the hermaphrodite condition, and the inference was that the plant was *practically diœcious.*

On the 3rd of May I returned to the locality and found this hypothesis in all probability correct. The pistillate plants were in proportion about one-third that of the hermaphrodite, and could be readily distinguished after the flower had faded by the recurved stigmas above noted. All the plants that had shed their corollas were pistillate; the apparently hermaphrodite plants having their corollas dry on the receptacles, from which it was not easy to separate them—the scales of the calyx and a part of the stem coming away with them. This is so well-known a feature of impregnation in the development of a fruit, that I need not dwell much on the importance of this fact, as showing the fertility of the pistillate, and the sterility of the opposite form.

I engaged friends to furnish me specimens from other places. Dr. James Darrach finds them, as I have above described, in another locality on the Wissahickon. Miss Anderson sends me ten specimens from Edge Hill, Montgomery County, Pa., amongst which two are purely pistillate, the rest varying much as in the Wissahickon specimens. Mr. Isaac Burk finds pistillate plants abound at Mount Ephraim, New Jersey, but there are abortive filaments without anthers, and he sends me one specimen of this character. Mr. Charles E. Smith sends me a dozen or so specimens from Haddonfield, hermaphrodite, and so exactly alike that they probably all come from one plant. Mr. E. Diffenbaugh sends ten specimens from another place in New Jersey, all with anthers, but varying from nearly none to filaments three-eighths of an inch long; varying also in the proportionate lengths of scales, tubes and segments; but not near as much as in the Wissahickon specimens. Professor Cope sends samples from Delaware County, Pa. These are varied like the Wissahickon ones; and Mr. Cope remarks to me that the pistillate forms are so distinctly characterized, by the vasiform recurved corollas and other characters, that he can readily distinguish them as he walks along.

Has this peculiarity of *Epigæa repens* been overlooked by the many botanists who must have critically examined it heretofore? Or has the plant reached a stage of development when germs of new forms spring actively into life?

In a paper on *Lopezia*, published in the last volume of the Proceedings, I showed that the sexual organs of that genus were admirably arranged to prevent the pollen of a flower falling on its own stigma. This behaviour of *Epigæa* adds another to the list of plants, now so

extensive, known to have an abhorrence of self-fertilization. It may not be out of place to hazard a reason for this course:

There would seem to be two distinct principles in relation to form going along together with the life of a species. The tendency of the one force is to preserve the existing form; the other to modify, and extend it to newer channels. The first we represent by the term *inheritance*, the other we understand as *variation*. Inheritance struggles to have the plant fertilize itself with its own pollen; whilst the efforts of variation are towards an intermixture of races or even neighbouring individuals, rather than with members of the one brood or family. May it not be possible that at some time in their past history all species of plants have been hermaphrodite? that Diœcism is a later triumph of variation, its final victory in the struggle with inheritance? There are some difficulties in the way of such a theory, as there are with most of these theories; but it seems clear from this case of *Epigæa* that cultivation has not as much to do with changes as it gets credit for, and we may readily believe that, independently of external circumstances, there is a period of youth and a period of old age *in form* as well as *in substance*, and that we may therefore look for a continual creation of new forms by a process of vital development, just as rationally and as reverently as for the continued succession of new individuals.

The discovery of diœcism in *Epigæa* is interesting from the fact that it is probably the first instance known in true *Ericaceæ*. In the Erical suborder of *Francoaceæ*, abortive stamens are characteristic of the family, and in the *Pyrolaceæ* antherless filaments have been recorded.—*Meehan's Gardener's Monthly, February*, 1869.

ON THE PLANT REMAINS FOUND IN THE CRETACEOUS AND TERTIARY STRATA OF NORTH AMERICA.

The Cretaceous flora of Britain, and indeed of Europe, presents an assemblage of plants very different from those which succeeded them in the same area, either in Tertiary or recent times. The fruits of *Pandaneæ*, arborescent *Liliaceæ*, several genera of *Cycadeæ*, species of *Araucaria* and *Sequoia*, with numerous Ferns and gigantic *Equiseta*, are found in the Cretaceous beds of Britain. M. Coemans has de-

scribed a singular collection of coniferous fossils from strata of Calcareous age occurring in the Belgian province of Hainault, but with them is associated a Cycad belonging to an extinct tribe of the Order. No trace whatever remains of these Cretaceous plants in the existing flora of the regions where they are found. A corresponding *facies* of vegetation can be found at the present day only in tropical regions, and to a considerable extent the same may be said of the vegetation of the Tertiary strata. The tropical character is not so strongly pronounced, but the Orders and genera represented are more southern forms than those now living in Europe. Two or three Palms, species of *Smilax*, *Cinnamomum*, *Liquidambar*, *Liriodendron*, etc.; numerous forms of *Proteaceæ*, referred to the modern genera *Banksia*, *Dryandra*, *Hakea*, and *Persoonia*, and coniferous forms belonging to *Sequoia*, *Taxodium*, *Glyptostrobus*, *Frenela*, etc.,—form a group of plants the modern representatives of which must be sought sometimes in America, sometimes in Australia, and at others in Asia or Africa, but least of all in Europe, and, in the few cases that do occur in Europe, only in the Mediterranean region of the Continent. The Tertiary flora is much further removed from the existing vegetation of Britain than it is from the Cretaceous flora, and yet from this it is very clearly distinguished.

In America the relations of these successive floras are very different. Many genera are common to each of the three periods, and no very marked line of distinction can be drawn between either of them. Professor Newberry has just given us the means, of forming an approximate estimate of the facies of the two extinct floras,* in a recent Essay, which, besides containing much new and original labour, gives a narrative of all that has been done before. The plants found in Cretaceous rocks were at first believed to be of Tertiary age, on account of the modern character of the genera found among them. The true stratigraphical position of the rocks in which they occur has, however, been established, beyond a doubt, from the discovery of unmistakable Cretaceous shells in them, like *Gryphæa Pitcheri* and *Inoceramus problematicus*. The forms enumerated by Newberry contain only a few, which have disappeared from North America, such as *Cinnamomum*, *Cissus*, *Ficus*,

* Notes on the Later Extinct Floras of North America, with description of some new species of Fossil Plants from the Cretaceous and Tertiary Strata. Annals of the Lyceum of Nat. History in New York, vol. ix. 1868.

Araucaria, and *Salisburia*; they especially abound in genera still bulking largely in the flora of the United States. Among these may be enumerated 7 species of *Populus*, 4 of *Salix*, 6 of *Quercus*, 2 of *Magnolia*, 2 of *Platanus*, together with representatives of *Diospyros*, *Aristolochia*, *Sassafras*, *Liriodendron*, *Taxodium*, *Cupressus*, etc., some of which are confined, as living plants, to the American continent, though they are found in Europe in Tertiary strata. The genera indicating a warm climate, like *Sabal* and *Cinnamomum*, are from the west coast; while the Cretaceous beds of Kansas, Nebraska, and New Mexico have hitherto yielded no fossils of a tropical or even of a subtropical character. This difference in the character of what was probably contemporaneous floras, is supposed to have been caused by the existence of an elevated central region separating the two sides of the broad continental surface on which the plants grew. This would give physical conditions, not unlike those of the continent at the present day, the isothermal lines being similarly curved over the surface. It would thus happen that Palms and Cinnamons would, from the conditions of temperature, be restricted to the western region of the Cretaceous continent.

Many of the genera found in these Cretaceous beds are represented in the Tertiary strata, and they are accompanied with numerous other forms, linking them still more closely with the vegetation of the present day. These comprise such genera as *Cornus*, *Negundo*, *Carya*, *Sapindus*, *Aralia*, *Amelanchier*, *Planera*, *Rhus*, *Sequoia*, and *Thuya*. The resemblance which this fossil flora bears to the living vegetation of the United States is very obvious. It agrees also to a considerable extent with the present flora of Japan and China, and with the fossil plants from the Miocene beds of Europe. Among the American Tertiary plants is a species of *Glyptostrobus*, of which there is a large number of specimens, and which cannot be distinguished from *G. Europæus*; and other species (*Taxodium dubium*, *Sequoia Langsdorfii*, etc.) are very closely allied to European fossils, if they are not indeed identical with them.

From the Tertiary flora, when looked upon as the precursor of that which now occupies North America, several important genera are wanting, which will most likely be yet discovered. Among the most striking of these deficiencies may be mentioned *Acer*, *Quercus*, *Liriodendron*, *Liquidambar*, *Sassafras*, etc., some of which appear among the

vegetation of the Cretaceous period, and all of them are members of the European Miocenes.

Among the Ferns from the Tertiary strata is an *Onoclea*, which Professor Newberry cannot distinguish from the living American *O. sensibilis*, and which he considers the same as *Filicitis ? Hebridicus*, Forbes, from the Miocene beds of Mull.

W. CARRUTHERS.

CORRESPONDENCE.

Wilkomm and Lange's Spanish Flora.

"Terra ferax Cerere, multoque feracior uvis."—Ovid, Am., ii. 16. 7.

Dear Sir,—At page 239 of your fourth volume you state that, unless a few more subscribers can be obtained, the publication of Wilkomm and Lange's 'Prodromus Floræ Hispanicæ' must be discontinued.

It is now exactly thirty years since the late Philip Barker Webb expressed a hope that Spanish botanists would at length awaken from their *ὕπνον λήθαργον βαθύν*, and endow science with a complete catalogue of what he rightly characterized as "the richest and most varied flora in Europe."

This appeal has been partially responded to by Colmeiro, Costa, Graells, and a few others, whilst Webb, Boissier, Reuter, Kunze, Cosson, and Gay have done still more towards the description of Spanish plants. Nevertheless, while the vegetation of every other European country is critically illustrated, in one or more standard works, Spain and Portugal alone have no Flora, the extensive and valuable collections made of late years, amongst which the magnificent ones of Bourgeau stand pre-eminent, though worked up more or less completely, having never been brought together and revised by a competent botanist, familiar with the country.

To collect these *disjecta membra*, and study them comparatively from a uniform point of view, was the task undertaken by Professors Wilkomm and Lange; and, so far as the work has progressed, it must be admitted that, as regards scientific accuracy in the diagnoses, fulness in the indications of geographical distribution, and neatness in the typography, it has been admirably executed.

It seems scarcely credible, and is a reproach to European botanists, that a work of this nature, of inestimable value for the study of the statistics of the vegetation of our continent, should not have met with sufficient support to cover the expense of publication. If Boissier's 'Flora Orientalis' proceeds with the steadiness and rapidity which the circumstance that the material must already, to a great extent, be prepared and arranged, gives fair reason to expect, we shall in a few years—unless some effort is made to prevent the abandonment of an undertaking for which the materials exist, and whereof the

susceptors seek only to be secured from personal loss—possess a more complete manual for the floras of Greece, Turkey, Egypt, Syria, and Western Asia, than for that of the Iberian peninsula; whilst Italy, so long distracted and misgoverned, besides innumerable local Florulas, and the works of Moris and Gussone for Sardinia and Sicily, has given us a complete Flora of the country in ten volumes, and another in course of publication which will probably attain equal length.

My object in addressing to you this communication, which I earnestly hope may meet the eyes of Prof. Wilkomm, is to point out that, under the altered political circumstances of Spain, and with a growing desire for enlightenment, an application to the Government to subscribe for 50 or 100 copies, to be placed in the principal libraries, could scarcely fail to meet with a ready and favourable response.

I trust my suggestion will not be neglected, and that its success may prevent a calamity which would demonstrate too clearly that, while many talk of the progress of our science, there can be comparatively few who take a real interest in it.

H. F. Hance.

Whampoa, China, December 11, 1868.

MEMORANDA.

The Rev. J. E. Leefe requests us to announce that he is now prepared to send off copies of the first *fasciculus* of the 'Salictum Exsiccatum,' postage paid, on the receipt of 8*s*., either in stamps or by Post Office order. Address, Cupwell Vicarage, Morpeth.

The Wollaston Fund has been awarded by the Council of the Geological Society to Mr. W. Carruthers, of the British Museum, in consideration of his researches in fossil botany.

A Memor of the late Professor Harvey, of Dublin, has just been published by Messrs. Bell and Daldy.

Dr. H. C. Wood has discovered a plant growing in a hot spring at Benton, Owen's Valley, California. The temperature of the spring is often 160 degrees. The plant he names *Nostoc caladarium*. It not only grows freely in water of this very great temperature, but supports on itself a simpler structure, which he has designated *Chroococcus thermophilus*.

The Pines of California.—At a recent meeting of the California Academy of Sciences, Dr. Bolander said there were but fifteen species indigenous to the State. Of Firs there were but four. He said Mr. Murray had a fifth, which he called *Picea magnifica*, which was but *P. amabilis*. He thought the European botanists multiplied species in the interest of seedsmen, as there was such a demand in Europe for seeds of *new* things.

Thuja and Libocedrus.—We have been requested, by Mr. Robert Brown, to correct an error which has crept into his "Monograph of the Coniferous

Genus *Thuja*, Linn., and of the North American Species of the Genus *Libocedrus*, Endl." in its passage through the press. At page 363 of the volume in which it is contained (Trans. Bot. Soc. Edin. ix.), the parallel columns containing the characters of the two genera should be transposed, and the word "the," fifteenth line from foot of p. 362, last word in the line deleted. This error is evident both from the context and the preceding and following matter, but as it stands is apt to be confusing.

Dr. Masters lately exhibited, at a meeting of the Scientific Committee of the Royal Horticultural Society, a specimen of a monœcious Mistleto, sent by Mr. George Thomson, gardener at Stansted Park, Sussex. The same main trunk bore short, stiff, compact shoots, with small leaves of a dark green colour, and ripe berries, and, at the same time, long, slender, pendulous, whip-like shoots, with larger yellow-coloured leaves, and perfect male flowers in full bloom. Dr. Masters stated that he had never before seen or heard of a similar instance in the Mistleto, though analogous cases in other ordinarily diœcious plants were not unfrequent. Professor Oliver, who had paid much attention to the *Loranthaceæ*, had also informed Dr. Masters, that he had not seen any record of monoicism in the Mistleto, though such a condition was common in some of the other genera of the Order. Professor Oliver also remarked that the present case was the more remarkable from the fact that the sexual characteristics of Mistleto are usually so well marked that it is possible to distinguish the male from the female plants at a distance by their colour or general aspect. It was suggested by some members of the Committee that this might be a case of natural grafting, owing to a seed having fallen on the male plant, and there germinated—a parasite on a parasite!—but this view of the case was not borne out by a section of the branch.

Mr. Wilson Saunders, at the same meeting, exhibited a Hyacinth of the variety called "Robert Steiger," in which the flowers, instead of being of their usual carmine colour, were all green. The difference in colour was associated with still more important variations in form and direction, the flowers having all of them an elongated tubular form, and an erect direction. It was stated that the anthers were of a pink colour, and somewhat deformed. The Hyacinth in question had been grown under precisely the same conditions as others which were unaffected. Mr. Berkeley alluded to similar instances of virescence or phyllomorphy in *Colchicum autumnale*, and Dr. Masters to the like phenomena in some species of *Convallaria*.

BOTANICAL NEWS.

Edinburgh Botanical Society met on Thursday, 14th January, 1869, at 5, St. Andrew Square, Dr. Cleghorn, President, in the chair. The following communications were read:—I. Biographical Notices of Carl Friedrich Phillipp von Martius, M.D.; and Adalbert Schnizlein, Ph.D., late members of the Society. By Dr. Cleghorn. II. The Lichen Flora of Greenland. By Dr. Lauder Lindsay. The author stated that his attention had been drawn to the lichen

flora of Greenland by being requested in the winter of 1867–8, by Mr. Robert Brown, to examine and determine the lichens collected in West Greenland in the course of the "West Greenland Exploring Expedition" of 1867. On studying in connection with the determination of the species so submitted, the literature of Greenland lichenology, he was surprised to find that there was no recorded modern list of the lichens of that country. Accordingly, the author had drawn up a list of all the lichens which to the present day had been found, or recorded to have been found, in Greenland, compiled from all the sources of information accessible to him. The list included 268 species and varieties. III. Notes on *Diatomaceæ* from Danish Greenland, collected by Mr. Robert Brown. By Professor Dickie. No. 1. All the species recorded were British, with the single exception of *Hyalodiscus subtilis*, originally described by the late Professor Bailey, from Halifax; found also on the shores of North-west America, and now on the shores of Greenland. IV. Mosses collected by Mr. Jenner and Mr. Howie in Ross-shire in July 1868. By Mr. Charles Howie. The author described the parts of Ross-shire visited, and enumerated the different species of Mosses collected, with special reference to the situations and conditions of growth. The paper was illustrated by dried specimens of the plants. V. On the Staining of Microscopical Preparations. By Dr. W. R. M'Nab. The author enumerated a large series of experiments he had made by staining certain microscopical structures with acetate of mauvine and Beale's carmine solution. He showed that by means of staining, the high powers of the microscope can be used to bring out points of structure not easily demonstrated without being so treated. The process of staining does not seem to be attended with any great difficulty, and the author believes that very important results may be obtained by careful study of its action on germinating plants. VI. Letter from Dr. R. O. Cunningham to Professor Balfour. "H.M.S. Nassau, Valparaiso, 3rd November, 1868.—Rather more than a year ago I wrote to you, describing our experience during the first season we spent in the Strait of Magalhaens, and possibly you may be interested by a few notes of our proceedings during the past year. I shall confine myself principally, in the following remarks, to what I have observed in the way of botany. We entered the strait on the 17th of November, 1867, and reached Sandy Point two days later, on a lovely spring morning, recalling the month of April at home. The fresh green foliage of *Fagus antarctica* was really refreshing to the eye after our sea cruise, and a considerable number of flowering plants were in bloom. The *Berberis empetrifolia* covered the ground in many places with its prostrate stems, thickly covered with blossoms which diffused a faint perfume, and the *Primula Magellanica* was abundant, some specimens possessing white and others beautiful purple flowers. *Ribes Magellanicum* was also in full flower, and so were two or three *Cruciferæ*, and a pretty little Saxifrage (*S. exarata*) bearing a close general resemblance to our *S. tridactylites*. We remained at the settlement for about a week, during which I had many walks about the neighbourhood, obtaining a considerable number of specimens, botanical and zoological, and then moved eastward, spending a few days at Cape Negro, where I procured *Oxalis enneaphylla*, *Arabis Macloviana*, *Embothrium*

coccineum, *Geum Magellanicum*, and a variety of other plants. Shortly after that, a long and tedious period ensued, the officers being occupied in deep soundings, and as the ship lay a long distance from land, and there were gales without number, I was very much confined on board. Towards the end of December, we visited the Gallegos River, about thirty miles to the north of Cape Virgins, in search of a deposit of fossil bones of mammalia, but were unsuccessful in our quest, and about the middle of January we went across to the Falkland Islands to provision and coal. We remained in Stanley Harbour about ten days, and I was more favourably impressed with the surrounding country than I was on my first visit. *Callixine marginata*, *Chabræa suaveolens*, *Drosera uniflora*, *Pratia repens*, *Empetrum rubrum*, *Gentiana* sp., *Serraria Magellanica*, *S. alpina*, and *Aspidium mohrioides*, and various other plants were procured. On our way back to the strait we passed through Falkland Sound, visiting the Tyssan group of islands, where I saw the Tussac (*Dactylis cæspitosa*) in great luxuriance, and found the ripe fruit of *Rubus geoides*. We also spent a day at Fox Bay (West Falkland Islands), and there I obtained two Orchids which I had not previously met with. We had very blowy weather for some time after our return to the Cape, which greatly retarded operations. I spent a week during that time tented-out in Patagonia, but got very little in the way of specimens for my trouble, the most interesting 'find' being *Crantzia lineata*, which does not appear to have been previously recorded from the Strait, though it is recorded in the 'Flora Antarctica' as occurring in the Falkland Islands. I forget whether I mentioned in my former letter, that *Apium graveolens* is extremely abundant on both sides of the eastern portion of the strait, wherever the land is at all damp, and, as Dr. Hooker has observed, is perfectly wholesome. The survey of the eastern portion of the strait was at length brought to a close, and after a few days' sojourn at Sandy Point in the first week of March, we set out to get a fresh supply of provisions at Chiloe, passing through the western part of the strait and the channels leading northwards from it to the Gulf of Penas. We halted at various places on our way, and I made use of all the opportunities that came of going ashore and hunting for specimens. At Playa Parda Cove, in the western part of the strait, I obtained, among other plants, *Philesia buxifolia*, *Desfontainia spinosa*, *Escallonia macrantha*, and a Myrtaceous plant, which seems to be *Metrosideros stipularis*, and which does not seem to have been previously met with to the north of the Chonos Archipelago. It is, however, abundant in the channels, and constitutes a well-marked feature in the vegetation, frequently forming a distinct belt where the precipitous land dips into the water. At Poll Bay, where we spent two or three days, I found *Gaultheria antarctica*, generally growing along with *Myrtus Nummularia*, and easily mistaken for it at first sight, and *Tetroncium Magellanicum*. Here, as in most places in the channels where there was any open ground, a solid turf was formed of plants of *Gaimardia*, *Astelia*, and *Caltha dioneæfolia*; and a species of *Prestonia* was plentiful in the shallow pools of freshwater. At Eden Harbour, in the Messier Channel, I met with *Podocarpus nubigenus*, forming handsome trees, and a curious little dwarf conifer, which also occurs on the mountains of Val-

divia (and which Philippi has described under the name of *Lepidothamnium*), as well as *Mitraria coccinea*, not before obtained to the south of the Chonos Archipelago. We arrived at the fort of San Carlos, Chiloe, at the close of March, and remained there about a fortnight, and I was greatly interested in the striking character of the vegetation. Here I saw for the first time thickets of an arboreous grass of the genus *Chusquea*; *Myriaceæ*, *Bromeliaceæ*, Escallonias, and Fuchsias constituted a very prominent feature. The trunks of many of the trees were covered with *Sarmienta repens*, and their branches with a scarlet *Loranthus*; and *Gunnera scabra* covered many of the sandstone cliffs with its large Rhubarb-like leaves. Other conspicuous plants were a yellow-flowered *Loasa* and *Berberis Darwinii*, and last, but not least, our common *Digitalis*, which has completely naturalized itself. We left the Bay of San Carlos on the 12th of April, to return to the channels, passing between Chiloe and the mainland, and calling at two forts in the island on our way. At the first of these (Cava Oscura) I found *Tricuspidaria* in flower, and was considerably puzzled as to its affinities (Dr. Hooker has since set me right with regard to it). The drooping crimson flowers give the tree a most remarkable appearance. Our next halting-place was Port Otway (Cape Tres Montes). I spent an afternoon on shore there, and found *Veronica decussata* growing 6 to 8 feet high, and a beautiful Gesneraceous creeper, which I took for a species of *Drymonia*, but which I am inclined to suppose to be a *Columnea*. We entered the Messier Channel on the 17th of April, and remained there for about a month, surveying the harbours, during which we had almost perpetual rain. I was interested by procuring in several localities specimens of a handsome Bignoniaceous creeper with rose-coloured flowers, and was in hopes that it might prove new, but have since found that it has been previously procured from Valdivia, being Philippi's *Tecoma Valdiviana*. It does not appear to have been met before to the south of Valdivia, so this discovery of it in the channels extends its distribution several hundred miles. I have not said anything yet about the Cryptogamic plants of the channels. There are some very beautiful ferns (chiefly *Hymenophylleæ*), Musci and Lichens: but the greater number of them occur also in Chiloe and the south parts of Chili, and I did not meet with such a great number of species as I was led to expect. One, a species of *Hypopterygium*, greatly delighted me by the beauty of its growth, resembling that of a miniature Palm-tree. We left the channels in the middle of May, as the weather was so inveterately bad that surveying operations were rendered impossible, and, after a short stay at Chiloe, set out for Valparaiso, calling at Lota and Concepcion on the way. At Lota I saw for the first time that splendid creeper, the Copigne (*Lapageria rosea*). It was in great glory, flourishing even in the vicinity of the copper-smelting works, where almost all other plants were killed by the sulphureous smoke. We reached Valparaiso on the 12th of June, and remained till the end of July, having an extensive experience of northerly gales, accompanied by rain. As it was winter when we arrived, but few plants were in flower. A little yellow Oxalis, known to the Chilians by the title of 'Flor de Perding,' formed bright-coloured patches on the hills, and a Fuchsia with small pink

flowers was blooming abundantly. I made a short excursion to the small town of Santa Rosa de los Andes, at the foot of the Cordillera. There the lower hills bristle with tall Cacti, usurping the place of all other vegetation, and in many cases covered with a parasitic leafless *Loranthus*, with bright scarlet flowers. We spent the month of August very agreeably at Coquimbo, and there I made the acquaintance of the *Nolanaceæ* for the first time; *Alona cœlestis* covering the lower slopes of the hills, and two species of *Sorema* being abundant on the lower ground. There, also, I saw for the first time the *Aristolochia Chiliensis*, the beautiful little *Schizopetalon*, *Carica pyriformis*, *Llagunoa glandulosa*, *Schizanthus fimbriatus*, two species of *Caladenia*, a *Trichopetalum*, etc. We returned to Valparaiso in the beginning of September, and here we have been since. There is now a wonderful variety of plants in flower on the hills and intersecting quenadas,—*Tropæolum tricolorum*, two yellow Calceolarias, a yellow and a deep purple *Oxalis*, a scarlet *Alonsoa*, several species of *Œnothera*, *Pisathea cærulea*, *Puya coarctata*, a *Verbena*, *Adesmia salpiglossis*, *Argemone*, *Tupa*, *Schizanthus*, *Anemone*, *Polygala*, etc., being specially plentiful. To-day we start for the south, there to remain for the next six or eight months. Excuse the hurry with which this letter has been written, and believe me, my dear Sir, most truly yours, ROBERT O. CUNNINGHAM." VII. Report on the Open Air Vegetation at the Royal Botanic Garden. By Mr. M'Nab. VIII. Report on the Botanic Gardens of Natal. By Mr. J. M'Ken, Curator.

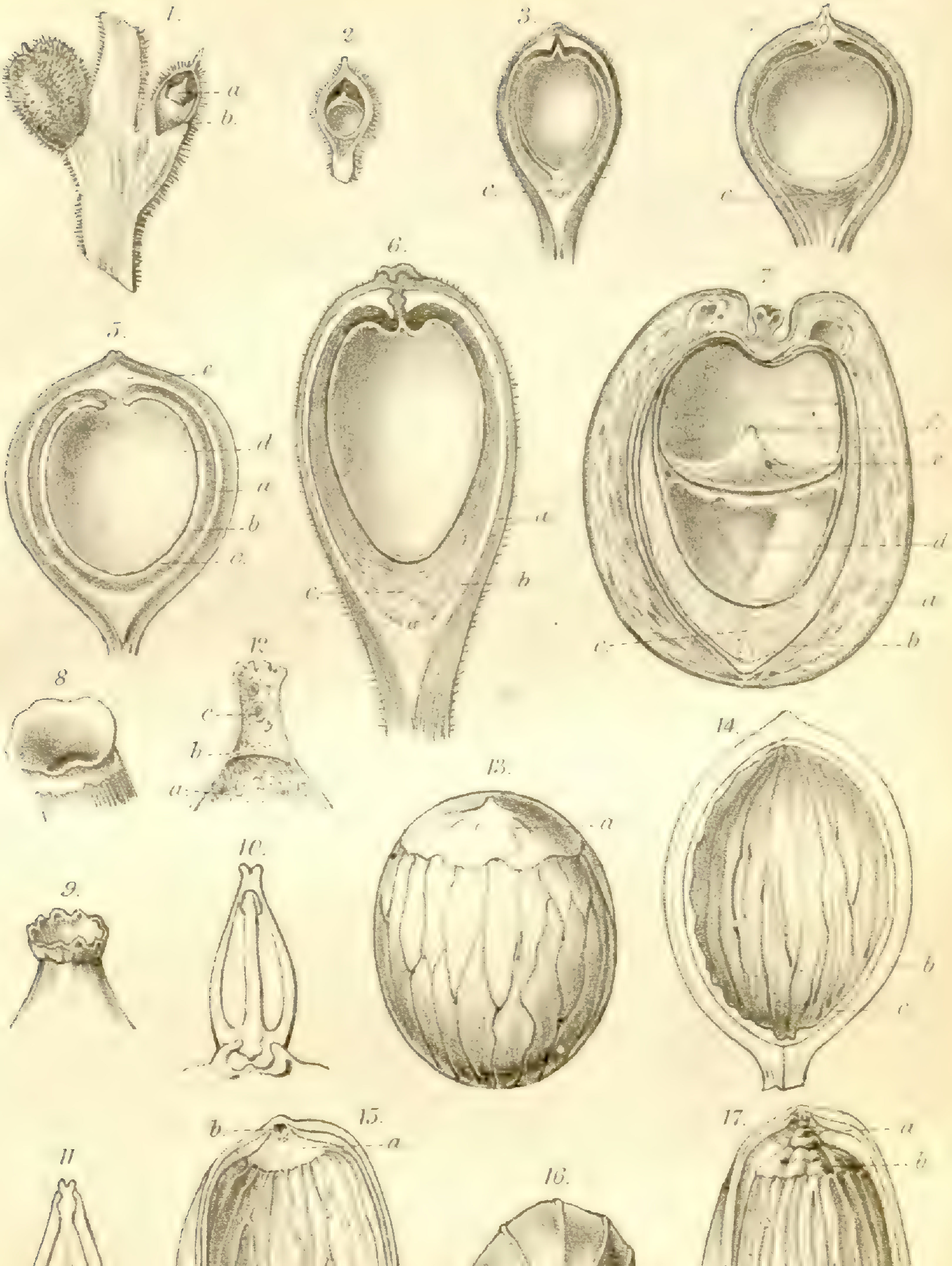
Thursday, February 11.—Charles Jenner, Esq., Vice-President, in the chair. The following communications were read:—I. Experiments on Colour-Reaction as a Specific Character in Lichens. By Dr. Lauder Lindsay. The author remarked that the colour-reactions of lichens, the effects of certain chemical re-agents applied to their thallus or apothecia, had recently acquired considerable importance, in consequence of the strong assertions of Dr. Nylander and the Rev. Mr. Leighton, as to the value of the reactions in question in specific or botanical diagnosis. These observations had led the author to make a special series of experiments, in order to test the accuracy of the statements, and the following are the general conclusions to which he has arrived:—1. The same specimen, in the hands of the same operator, in its different parts, at different times, frequently exhibits colour-reactions different at least in degree. 2. The same species, in the hands of the same operator, and, still more so, in those of different experimenters, in different specimens from the same or different localities, differing in freshness of collection or age, occurring in different varieties or forms, or in different conditions of growth (fertile or sterile, hypertrophied or degenerated), frequently shows colour-reactions differing equally in kind and degree. 3. Colorific quality is determined by circumstances (not fully understood) connected with (*a*) locality of growth in relation to climatic, geographical, topographical, geological, or other conditions. (*b*) States of development, in relation to sterility, hypertrophy, or degeneration of the vegetable tissues proper. 4. This inconstancy of colorific property leads the archil manufacturer never to depend on laboratory testings in the purchase of his "orchella weed," or in determining its commercial value; for it not un-

frequently happens that a most promising *Roccella* even proves worthless, and is, as such, cast aside. 5. Colour-reaction, though interesting in itself in connection with the general subject of lichen colorific or colouring matters, affords *no aid that can be depended on*, either (*a*) to the systematist in defining species, or (*b*) to the dye manufacturer in determining the value of his "orchella weed." II. Notice of a Journey from Deyrah Dhoon to Jumnotri. Part 1. By Mr. William Bell. III. Remarks on some Deep-Sea Dredgings, transmitted by Captain William Chimmo. By Professor Dickie. The dredgings, which were taken by Captain Chimmo from great depths in the Atlantic, immediately under the Gulf stream, at 2000 fathoms, in lat. 47° 3′ N.; long. 23° 21′ W., and at 600 fathoms in lat. 45° 42′ N., and long. 47° 39′ W., had been minutely examined by Professor Dickie. He found that in the matter from 2000 fathoms there were two Diatoms, one identical with *Coscinodiscus minor*, and the other a species of *Cocconeis*, which he had not yet determined. He had treated some of the material with weak acid, in order to judge, from the amount of sarcode left, whether the foraminifera (which were abundant) were living, or merely the shells after death and decay. He had come to the conclusion that they were living, but whether the Diatoms mentioned were so he could not say. Among the material he found several species of *Polycystida*. Specimens of the dredgings were shown under the microscope. IV. Notice of the Occurrence of *Amblystegium conferroides*, Bruch and Schimper, in Westmoreland, by Mr. J. M. Barnes. Communicated by Mr. P. N. Fraser. Mr. Barnes gathered this moss in 1867, in considerable abundance on loose stones in damp wood near Levens. He has gathered it in many different places since. It always occurs on limestone, and is apt to be overlooked for a small form of *A. serpens*. Specimens were exhibited and presented by Mr. Barnes to the herbarium. V. Report on the Open Air Vegetation, at the Royal Botanic Garden. By Mr. M'Nab. VI. Miscellaneous Communications. 1. *Aster salignus.*—A note was read from Miss Beever, recording the occurrence of *Aster salignus* on the shore of Derwentwater, where it was collected by Miss Edmonds, in 1868, in flower. This plant also occurs near Cambridge, and in several places on the banks of the Tay, between Dalguise and Seggieden. In one locality below Perth, Dr. White remarks that it is associated with several introduced plants, such as *Linaria repens*, *Petasites alba*, *Sanguisorba Canadensis*, *Mimulus luteus*, *Crocus vernus*, and *Narcissus Pseudo-narcissus*, which are all more or less common, and well established along the banks of the river. In France, *Aster Novi-Belgi* seems to hold the same place as *A. salignus* does in Britain—that of an exotic plant, well established on the banks of several rivers, as near Strasbourg, Laugre, and Lyons. 2. Rare British Mosses.—A note was read from Mr. James Hardy, Old Cambus, enclosing specimens of *Dicranum elongatum*, which he collected near the summit of Hedgehope, Northumberland, in July last; and recording the occurrence of *Dicranodontium aristatum*, in Roxburghshire, where it was first gathered by Mr. Jerdon in 1864, and *Grimmia contorta*, on the Cheviots, collected by himself in May, 1868. Mr. Hardy is at present engaged in drawing up a list of the Berwickshire Mosses, which will shortly be published.

W. G. Smith, lith.

Vincent Brooks, Day & Son, Imp.

Tab. 91



W. G. Smith, lith.

Vincent Brooks, Day & Son, Imp.

Tab 91

W. G. Smith, del. et lith.

Vincent Brooks, Day & Son, Imp.

ON THE SEXUAL ORGANS OF THE CYCADACEÆ.

By F. A. W. Miquel.

Translated by W. Thiselton Dyer, *B.A.*

(Plates XCI. and XCII.)

(*Concluded.*)

The suspensors spring from the base of the corpuscles. They are more or less spirally twisted, and descend at first to penetrate into the central cavity of the endosperm, but afterwards they are more or less pushed upwards by the embryo. I have not succeeded in ascertaining if the suspensors of neighbouring corpuscles can coalesce with one another. It often happens that only one suspensor is well developed, and this produces the embryo. This is shown in Plate XCII. fig. 2 and 4, where the suspensor proceeds from a corpuscle which appears lacerated, or has been destroyed in making the section. Its remains are still visible at the base of the sterile corpuscles. In fig. 8 however, there are two twisted suspensors, the longest of them bearing the embryo. The suspensors produce lateral branches which terminate in rudimentary embryos in the form of tubercles (fig. 4 and 8).

These filamentary bodies represent the structure which the older carpologists called the *filum suspensorium*, and which R. Brown called the *suspensor*. I have proposed for it, in consideration of its function, the name *embryoblastanon*. Others had applied the term *proembryo* to it. In no other group of plants is this structure so complex as in Cycads. It is more or less cylindrical in shape, and composed of an aggregation of numerous elongated cells (Plate XCII. fig. 7). The remains of a delicate membrane may be distinguished on its surface; I am not able to give any explanation of it, but it may possibly be caused, like the membrane on the surface of the embryo, by a slight adhesion to the endospermic tissue. Such an adhesion might easily take place between the superficial cells of organs which are in contact during the time of their growth. The consistence of the filament is firm and solid. It is only at the point of junction with the embryo that it breaks readily.

The endosperm, in the axis of which the embryo is tightly packed, is entirely unattached in the cavity which it occupies (Plate XCI. fig. 17; Plate XCII. fig. 11–13). At its surface the appearance of the

tissue is slightly different, but there is no definite membrane admitting of separation. I cannotcl early comprehend what Gottsche means by the yellow membrane which, according to him, covers the endosperm (Bot. Zeit. l. c. p. 398), unless he has in view the remains of the nucleus.

It is not unusual to see germination commence in the undetached seed itself; the radicle pierces the remains of the summit of the nucleus and appears externally (Plate XCII. fig. 11). We must interpret in this way the figure of the embryo of *Macrozomia* which I published in 1845 (Ann. des Sc. Nat. l. c.). In this instance the embryonic condition had been passed and the first leaves developed.

It must be remarked that in all Cycads the plumule is only composed of a few scales. On this and other points I may refer to my communications in the Ann. des Sc. Nat. l. c., and in 'Linnæa' xix. p. 5. The parts which produce the pollen,* and which compose the male cone, are in every point the morphological equivalents of the carpophylls. It would be perfectly correct to call them anthers, but from their analogy to the female organs, and to avoid the risk of confounding them with their loculi (which many authors continue very improperly to call anthers), it will be perhaps preferable to adopt the term *androphylls.* They are always smaller and simpler in shape than the carpophylls, but their structure presents no essential difference. The polygonal cells of the epidermis are much thickened, and the stomata are deeply situated among them.

The principal point which arises here relates to the development of the numerous polliniferous loculi ('*logettes*') which are situated on the under surface of the androphylls, and which were formerly looked upon as distinct anthers.† Mohl has observed with reason that the way in which I had explained in my monograph the evolution and morphological meaning of these loculi was not consistent ('Vermischte Schriften,' p. 57).

They are placed on the lower face of the androphyll (which is also their situation in the peltate forms) and on either side of the median line, and they spring in groups of two to four, or rarely of five from a

* The numerous figures which exist of these organs may be consulted.

† This was the opinion of Richard (Dict. Class. d'Hist. Nat. tome v. p. 216). Other views as to their nature are discussed by R. Brown in the Appendix to Captain King's Voyage (Miscellaneous Bot. Works, vol. i. p. 459, *et seq.*). Lindley (Veget. Kingd. p. 223), adopting Richard's view, terms the androphylls "antheriferous cone scales."—W. T. D.

common point of attachment. In their earliest stages they appear as slightly elevated protuberances or papillæ, green in colour, and covered by the epidermis, which they do not rupture. They are, in fact, excrescences of the parenchyma which are formed at particular points, and their internal tissue is consequently wholly cellular. Little by little they assume their elongated rounded form, and the entire mass of cellular tissue becomes pollen-generating tissue, because in the cavity, when matured, nothing but pollen can be found. Each cell [' parent cell '] produces four other cells, and each of these forms a pollen-cell. They are comparable to the regions where, in the loculi (' *loges* ') of ordinary anthers, the production of pollen takes place; and should receive, therefore, the name of loculi.

The formation of pollen does not take place over the whole organ as in angiosperms and most gymnosperms, but only at a considerable number of points on either side of the median line. The wall of the loculi is very firm. Its colour is brown at a period a little more advanced, and its exterior is marked with short linear impressions. It opens from the top to the bottom on the inner side or that which is turned towards the other loculi of the group, and sometimes the slit is prolonged beyond the summit on to the opposite side. Purkinje (' De cellulis antherarum fibrosis ') was not wrong when he termed the wall " mere epidermidalis," since the loculi are nothing more than erupted portions of the tissue of the androphyll, covered with the same epidermis as the rest. I may remark, however, that two cellular layers may be distinguished in this wall which may be also recognized in Purkinje's figures (Plate I. and Plate XVIII., belonging to *Zamia media* and *Encephalartos longifolius*). The external layer is the epidermis, the inner one is a parenchymatous layer of peculiar appearance, composed of porous cells.

The cells of the epidermis have a very narrow *lumen*. This gives rise to the superficial stripes mentioned above. The pollen grains exhibit a great uniformity throughout the whole family: they are more or less elliptical, with a deep longitudinal fold which does not entirely disappear in water. Thus, as Schacht first pointed out (Pringsheim, Jahrb. ii. p. 145, plate xvii. fig. 26–28), two secondary cells are also formed in the *intine* among the Cycads, so that the structure of the pollen is comparable in all respects to that of the *Coniferæ*.

If the views which have just been explained on the subject of the

reproductive organs of Cycads have any foundation, the two kinds of organs seem to follow the same course in their development and metamorphosis. Generating-cells originate at determinate points in the parenchyma of the leaves; the embryonal vesicles in the nucleus of the ovule, as the third generation ("*cellules petites-filles*") from the transitory amnios; the male cell, that is the pollen-tube or included cell of the intine, as the third generation from the androphyll or its loculi. Among Angiosperms the generating-cells are formed by a shorter course, as immediate products ("*cellules filles*").

The generating-cells have, like macrospores and microspores, their proper period of life. Produced, as the result of nutrition, by an individual of more elevated organization, although sexless, they each run through the phases of a brief existence; finally, they unite to produce the proembryo. It is only, indeed, among the *Algæ*, and perhaps some other lower plants, that fecundation produces the plant properly so-called—that is to say, the embryo; the embryonal vesicle, after fecundation, developes into a distinct structure, an individual wholly composed of cells (united in a linear direction, in one or more ranks). This is an axial product, the last cell of which, that of the summit, divides and produces the embryo by the repeated formation of new cells. The embryo is therefore its terminal bud, destined to produce, by its further development, the complex sexless individual, the plant properly so-called. The embryo, according to this, is not the germ of the plant, but the plant itself, which, after a period of physiological rest, will commence a fresh evolution, whence will spring a complete vegetable organism,—that is to say, an individual of a higher grade, composed of axes and buds, forming, as it were, as many single individuals. "Gemmæ totidem herbæ" (Linnæus).

The two successive forms of the plant have, in the same way, a very unequal duration of existence. The first, the proembryo, dies as soon as the embryo is definitely constituted; the vascular, sexless plant exhibits, on the other hand, an unlimited existence, at least apparently so, because in reality the circumstances are different. Each bud or axis is, in effect, a distinct individual. An axis which does not produce flowers only continues to exist as a point of insertion for successive axes; and an axis which has flowered, which has produced leaves with microspores and macrospores, lives no longer. Among gymnospermous plants in general, and especially among Cycads, the pro-

embryonic form persists much longer than usual. It is also much more complex; for, whilst among Angiosperms the proembryo only forms a simple axis, represented sometimes by a single cell, and only gives rise to a single bud, a single embryo, a single individual,—the proembryo of Gymnosperms divides into branches, and produces, or might produce, numerous buds or embryos. It imitates, to some extent, the higher sexless form, by its ramification and the production of multiplied buds combined into one whole. If we consider the life of the generating cells, the microspores and macrospores, as terminating at the moment of their mutual union, a view which admits of support, there would then be a triple alternation of forms within the limits of the individual. But it seems more simple to consider the sexless individual of more perfect organization as producing by generation, or differentiation, into two distinct states, a more simple organism of short duration, returning finally to the original form with higher organization, and life indefinitely prolonged.

Among the vascular Cryptogams, alternate generation manifests itself more clearly, because the two forms appear distinctly at the exterior, whilst among Phanerogams the cellular transitory organism is enclosed in a portion of the higher organism. The spores produced by the vascular sexless plant develope into organisms simple in structure and wholly cellular (*prothallium*), which produce the generating-cells. Among the lower vascular Cryptogams, both sexes originate from the same spore; among the higher, from different spores,—the one set microspores (male), the other macrospores (female). In both cases, however, a new individual results from their union, which possesses vascular bundles, is differentiated into stem and leaves, and is destitute of sex. Yet here the embryo does not proceed directly from the central cell of the archegonium; the first product is a proembryo, the terminal cell of which becomes the embryo. Thus, then, among Phanerogams, the generating-cells occur on the higher essential form, among the Cryptogams on the lower form.

Hofmeister has made the remark that the *Coniferæ* (the Gymnosperms) are with respect to the development of the embryo, intermediate between the higher Cryptogams and the Phanerogams. Among the Gymnosperms, the embryo-sac soon becomes free and detached from the tissues which surround it; the formation of the endosperm is comparable to the production of the prothallium; the corpuscles are

completely analogous to the archegonia. The embryo-sac of Gymnosperms holds, therefore, the same position as a spore which remains contained within the sporangium; the prothallium, which it produces, does not make its appearance externally; the fertilizing matter, in order to reach the archegonia, has to make its way through the tissues. The corpuscles, however, indicate by their numerous vesicles, of which only a single one is fertilized, a much more complicated condition than exists among the vascular Cryptogams. In these, or at any rate in the Ferns, there is only a single vesicle, the parent cell of the embryo, or rather of the pro-embryo.

Hofmeister sees, rightly, a great distinction in the fact that in Gymnosperms fertilization takes place, as in other Phanerogams, by means of a pollen-tube, whilst among the vascular Cryptogams this function is performed by spermatozoids. The contrast is certainly very marked, anatomically, but it seems less so from a physiological point of view. The matter which the male element conveys into the female element, through which it becomes the seat of a new vegetative evolution, is really of an analogous kind in the two cases. The difference affects more the external conditions of the function. Among the Phanerogams, an entire cell, the pollen-tube, deprived of its secondary envelope, moves towards the female cell, to which its fertilizing fluid must be transmitted by osmotic penetration. Among Cryptogams there are numerous secondary cells (spermatozoids) which proceed from the antheridium, and which—by means of the power of progression possessed by them, and under the influence of surrounding conditions—insinuate themselves into the archegonium, and penetrate into the interior of the female generative cell. But as to an essential and fundamental opposition between the contents of the pollen-tube and those of the spermatozoids, one cannot admit its existence after having learnt, especially from the researches of Schacht, to understand the nature of spermatozoids better.* We must add to this, that amongst the *Coniferæ*, it is not rare to see the pollen-tube penetrate into the corpuscle after having perforated its summit.

The parallelism which thus exists between the vascular Cryptogams

* Schacht, 'Die Spermatozoïden im Pflanzenreich, 1864.'—I have no knowledge of precise data as to the chemical properties of spermatozoids. It would not be without interest to ascertain if phosphorus enters into them in as great proportion as into the pollen (compare Corenwinder in the Ann. des Sciences Nat. 4me sér. xiv. p. 49.

and the Gymnosperms, not only fills up, to a certain extent, the gap which has hitherto separated the Phanerogams and the Cryptogams (a point which has been lately developed by Kirchhoff in a note full of interest inserted in the 'Botanische Zeitung,' 1867, Nos. 42, 43), but it reminds us that it was precisely the vascular Cryptogams and Gymnosperms which, up to the Cretaceous epoch (omitting from consideration a small number of Monocotyledons), represented the higher plants. The passage to the more complicated forms of Phanerogams, with hermaphrodite flowers and angiospermous structure, is exhibited to us by existing types of Gymnosperms. This is shown in the genera *Ephedra* and *Gnetum* (the last having two ovular coats) by the structure of their stem, by their leaves, and by the rudimentary perigonial envelopes of the still naked ovules. *Welwitschia*, the structure of which has been so completely made out by the excellent work of Hooker, though reminding us of Cycads by the form of its stem, of tropical *Coniferæ* by its leaves, and of *Gnetum* by its inflorescence, makes, on the other hand, the first step towards hermaphroditism (as yet unknown amongst the earliest Phanerogams up to the Cretaceous period, and perhaps even later) by the development of male organs within the same perigonium as a naked ovule. From this point organization advances a step in passing to the group of *Loranthaceæ*, regarded with the interpretation that Baillon has attached to it ('Mémoire sur les Loranthacées'). In *Welwitschia* hermaphroditism is still incomplete; in the *Loranthaceæ* we find its stage of development more advanced Looked at in this way, rudimentary organs appear not as atrophied parts, but as the first step towards a more complicated plan of organization, which is only realized slowly in the progress of time.

In agamic generation, individuals are reproduced with all their characters; they form, as it were, an indefinite chain of identical ramifications, and it is rare for this mode of reproduction to give origin to a deviating form.* In sexual generation this constancy of forms and characters is not possible. The two individuals which give origin to a

* We must not accept this statement without limitation, if it is to include all cases of agamic reproduction. In Bud variation in plants we have instances of new forms originating independently of sexual reproduction. The production of fleshy peach-like fruits by the Double Almond (Darwin, 'Animals and Plants under Domestication,' vol. i. p. 338), and of nectarine-bearing branches by Peach-trees (Darwin, p. 374) are examples.—W. T. D.

new being, are not in every respect and in every case in a uniform relation. If we measure the fertile pollen grains of any one species, we find them, it is true, to have an average size, but they may differ one from the other in dimensions, not to speak of difference in contents.

It is the same with the parts of the female organ. The fertilized embryonal vesicles ought equally, therefore, to differ from one another in the same individuals. They combine the characteristics both of the male and female parent, as is shown in a striking manner by the production of hybrids, but these characteristics are combined, in each case, in a slightly varied relation. This law, the effects of which are so decided in hybridizing, ought also to make itself felt, although in a less degree in the conjunction of microspores and macrospores belonging to the same species, but to different individuals. The dimorphism and trimorphism of flowers, digamic fertilization,—originally pointed out by Sprengel, in his admirable work ('Das entdeckte Geheimniss der Natur,' etc.), and which Darwin and many other writers in the same direction have placed in a more striking light,—must convince us that even among hermaphrodite plants, the self-fertilization of flowers is much more rare than had previously been believed.*

The change of form of the species is thus involved in fertilization; and in the succession of individuals, over which this function presides, we establish the law, that in each case the last generation must differ a little from that which precedes it. Ought we not to attribute to this intrinsic principle of variation, in addition to the action of natural selection, and of external conditions, a considerable influence in the progressive development of the vegetable kingdom? If such is really the case, the maximum of modification, the greatest variety of forms should be met with in the diœcious and monœcious groups, and generally among plants which are not self-fertilizing. The ascent of organization to a higher grade of complication is a law written in the history of the organic world, and the true cause of which resides in organization itself, just as the development of the individual is invariably determined in the conditions of the fertilized embryonal vesicle.†

* Fr. Hildebrand, 'Die Geschlechtsvertheilung bei den Pflanzen,' 1867.

† Among wholly inexplicable phenomena, we must incontestably include the law that many hermaphrodite flowers cannot fertilize themselves, and that they need the intervention of another flower of the same, or even, in some cases, of a different species. "Nature tells us, in the most emphatic matter, that she abhors perpetual self-fertilization" (Darwin). Has there been in the

In the economy of nature we find numerous and intimate relations between the vegetable and animal kingdoms, by which they mutually influence one another. Having recognized the fundamental law that the chemical compounds which serve to build up the animal structure have been elaborated by plants, we now see that, on the other hand, the animal kingdom forms an indispensable condition for the existence of vegetables. Fertilization, in the majority of cases an essential condition to the reproduction of vegetable species, is usually only possible among angiospermous plants by means of the intervention of insects. Where, formerly, it was only seen in isolated cases to which little importance was attached, modern science has discovered a natural law. At the same time it has shown that it is especially the *Diptera* and *Lepidoptera*, that is, sucking insects (Haustellata), which, unconscious fertilizers of plants, perform in nature the important duty of maintaining the existence of the vegetable kingdom, at least as far as the higher orders are concerned.

We may also consider this relation in connection with time, and inquire from what epoch it dates. The researches on fossil insects which we owe to Germar, Unger, Oswald Heer, and others, have shown that all the Orders of insects have not appeared simultaneously. In the Paleozoic epoch, when angiospermous Dicotyledons did not yet exist, *Coleoptera*, *Orthoptera*, and *Neuroptera* lived. These are mandibulate insects, which do not visit plants for their nectar. The first Diptera date from the Jurassic epoch, but the appearance in great numbers of haustellate insects occurs at and after the Cretaceous epoch, when the plants with pollen and closed carpels (Angiosperms) are found, and acquire little by little the preponderance in the vegetable kingdom.*

evolution of organic nature a tendency to arrive at the possibility of this self-fertilization? The separation of the sexes exists in all the lower plants; the vegetable kingdom commenced with it, and has held to this character in all past periods. Hermaphroditism has been established, and physiologically it exists at present but rarely. See on hermaphroditism, in its perfect form, Hildebrand, l. c. p. 57.

* The Upper Chalk of Aix-la-Chapelle is stated to be the oldest formation in which Angiosperms have been found. Among them species of *Quercus*, *Ficus*, *Juglans*, and of several Myrtaceous genera, with sixty to seventy species of *Proteaceæ*, have been ascertained by Dr. Debey (Lyell, 'Elements of Geology,' p. 330). As the proportion of Dicotyledons is nearly the same as in the vegetation of our own times (Lyell, l. c.), it is hardly possible to regard these remains as fixing the lower limit to the range in time of Angiosperms. And the Flora may have been still more varied. In our own indigenous vegetation,

When we examine the relations of the sexual organs in plants, it seems in many cases that the function of fertilization has been rendered in some manner difficult or even impossible. It might be said that nature does not wish to see its end attained except circuitously; as far as Angiosperms are concerned, a more precise knowledge of insect-agency has already to a considerable extent penetrated the mystery.

But there are other great divisions of the vegetable kingdom in which this agency has no place, and it is these which were already in existence before haustellate insects. I regard as such all the Cryptogams; among these the spermatozoids move towards the female organ by means of humid surfaces, drops of water, etc. Among the diœcious and monœcious Phanerogams which have preceded hermaphrodite species on the surface of the globe, their pollen is carried in excessive abundance by the winds, and the chances are greatly in favour of one of the millions of grains arriving at its destination. As to Cycads, I do not at present know any property which would be of a nature to attract insects in particular towards their female cones, either from nectar in the flowers, colour, or odour; at the same time, when one takes into consideration their being diœcious, and the complete occlusion of their female cones (except in the Cycads, where the ovules have the exostome outside, which would allow access to the pollen-grain), it becomes almost impossible to comprehend how the

for example, our most conspicuous species or trees hold, for the most part, a lower position than a large proportion of our herbaceous plants, whose perishable tissues would leave no trace in deposits, which might, however, contain fruits and leaves of *Cupuliferæ* in abundance. Without a knowledge to the contrary, these might lead an observer in examining such a deposit to the conclusion that the *Cupuliferæ* almost wholly composed our vegetation. Even without this consideration, it will hardly be admitted that Angiosperms had at their first appearance the same preponderance that they now possess. In America plants so modern in character, as to be at first believed to be of Tertiary age, have been found in Cretaceous rocks of even a lower horizon. ('Journal of Botany,' pp. 82–83, 1869.)

The connection between the periods of appearance in time of Angiosperms and haustellate insects is undoubtedly interesting. It must, however, be remembered that it rests on negative evidence, which in geology is necessarily far from conclusive. Their interdependence may be the cause of our finding them associated in time, but not necessarily so, as one of them may have preceded the other, without our having at present evidence of the fact. Theories as to evolution should only be sparingly illustrated from geological phenomena, and can draw but little support from them. For example, Dr. Debey has obtained about ten species of insects from the Aix-la-Chapelle beds. Yet these belong to the families *Curculionidæ* or *Carabidæ*, which are mandibulate insects. —W. T. D.

pollen can penetrate into the inverted ovule, from their opening, instead of being directed to the periphery, being applied against the axis of the cone. The difficulty increases when it happens, as in certain species of *Dioon* and *Encephalartos*, that the entire cone is covered with a compact pubescence,—is as if it were enveloped in a tissue of wool. Nature, however, finds its way, as is proved by the numerous seeds provided with an embryo which the ripe cone exhibits, as well as in Conifers, where it is common to see in our climate pollen fixed on the nucleus. The groups of plants whose origin extends to the palæozoic time, show themselves therefore to be independent of insects. They remain now as at the earliest period of their existence, and we see that nature adopts other means to bring the microspores into contact with the macrospores.

Note by the Translator.—In page 74, line 30, the last clause of the sentence should have been rather more correctly rendered, "It would be, besides, a structure of which I know no other analogue."

The meaning of the whole passage admits of being made clearer by a reference to Oudemans' view of the matter which Miquel controverts. The former writer states that "the epidermis of the entire ovule" (including its coat) "penetrates into the micropyliferous tube" (exostome), "and descends at first vertically, then obliquely, to the foot of the conical protuberance, to the summit of which it is reflected so as to cover it exactly, with the exception of its extremity ('Archives Néerlandaises,' ii. 1867).

Miquel considers that the epidermis of the coat, and the epithelium of the nucleus are distinct structures, although intimately united up to the point, where the cone of the nucleus detaches itself from the coat.—W. T. D.

EXPLICATIO TABULARUM.

(Si nihil adnotatum, figuras nat. magn. delineatas intelligas.)

Tab. XCI.

Fig. 1. Pars carpophylli *Cycadis revolutæ* longitudinaliter secta, vasorum fasciculos et canales gummiferos monstrans; *a*, pars nuclei libera; *b*, cavum amnii altero stadio incipiente.

Fig. 2. Ejusdem ovulum, amnii cavitate jam magis aucta.

Fig. 3–4. Eadem auctiora, nuclei textu; *c*, jam partim repulso.

Fig. 5. Idem provectius; *a*, integumenti stratum exterius molle; *b*, stratum

interius lignescens exostomium pro parte constituens; *c*, nuclei residuum membraniforme; *d*, nucleus.

Fig. 6. Idem, magis oblongum exemplar, nuclei textu copiosiore; *a*, *b*, *c*, ut supra.

Fig. 7. Ovulum valde juvenile *Cycadis Rumphii*, magnitudine auctâ delineatum; *a*, stratum ext.; *b*, internum integumenti; *c*, nuclei tela superstes; *d*, amnii cavum, membrana propria in vertice videnda; *e*, nuclei pars libera seu conus; *f*, ejus apex.

Fig. 8 et 9. Apex nuclei valde auctus, strato extimo firmiore excedente quasi tubulosus, *C. Rumphii* et *C. revolutæ*.

Fig. 10 et 11. Nuclei apex *C. Rumphii*, longitrorse sectus, canalibus ex telæ resorbtione ortus.

Fig. 12. Idem *C. revolutæ* telâ nondum resorbtâ; *a*, vertex amnii ante corpusculorum formationem; *b*, ejus membrana propria; *c*, nuclei conus.

Fig. 13. Endospermium *Cycadis mediæ*, impressionibus fasciculorum vascularium extus pictum, apice; *a*, nuclei cono nunc depresso collapso exsiccato operculi instar obtectum.

Fig. 14. Facies interior integumenti ejusdem seminis vasorum fasciculis percursa; *b*, pars lignea integumenti; *c*, membrana fusca ex residuo nuclei orta.

Fig. 15. Eadem *Macrozamiæ Fraseri*; *a*, epithelium integumenti partis liberæ internum; inferne ubi vasorum reticulum desinit nuclei conus adnatus erat.

Fig. 16. Pars lignea seminis *Encephalarti* speciei incognitæ, a basi visa, foraminibus e fasciculis vasorum intrantibus perfossa.

Fig. 17. Ejusdem semen, demto strato extimo; *a*, radicula progerminans; *b*, conus nuclei exsiccatus, endospermium apice obtegens; *c*, stratum membraniforme nuclei superstes; *d*, endospermium uti in fig. 13.

Tab. XCII.

Fig. 1. Vertex endospermii *Cycadis mediæ*, rejecto nuclei cono residuo, cum 6 areolis, quibus corpuscula subjacent auct. magnit. delin.

Fig. 2. Sectio endospermii perpendicularis, auctâ magnitudine delineata; *a*, areola; *b*, cavulum quo corpusculum amplectitur; *c*, corpusculum non fecundatum; *d*, residua seu fragmenta corpusculorum fertilium, e quibus prodeunt embryones; *e*, cavitas endospermii centralis, in quam descendit proembryo seu suspensor embryonis.

Fig. 3. Corpusculum, auct. magn. ante fœcundationem.

Fig. 4. *Macrozamiæ Fraseri* corpuscula quatuor; *a*, continentia massam subcellularem exsiccatam; *b*, probabiliter sterilia; *c*, fragmenta basium corpusculorum disruptorum; *d*, proembryo embryones steriles tuberculiformes; *e*, undique exserens, e parte ima (hic resectâ), embryonem normalem exserens (e semine in Tabula XCI. fig. 17, delineato), auct. magnit.

Fig. 5. Massa subcellularis e corpusculis (fig. 4, ad *b*) desumta et aquâ emollita, auct. magnit.

Fig. 6. Paries corpusculorum valde auctus.

Fig. 7. Sectio longitrorsa suspensoris seu axeos proembryonis, valde auct. magnit.

Fig. 8. *Macrozamiæ Fraseri* corpuscula, quorum apicibus adhærent fragmenta regularia, bases probabiliter canalium conductorum coni nuclei exhibentia; massa cellularis nunc in mediâ cavitate, proembryones sive embryonis suspensorem exserens, auct. magnit.

Fig. 9. *Zamiæ* cujusdam endospermium, apice nuclei cono depresso operculatum,

Fig. 10, cui deprompto corpuscula retracta inferne adhærent.

Fig. 11. *Encephalarti* incogniti endospermium apice nuclei cono exsiccato obtectum, radicula progerminante exsertâ (e semine Tab. XCI. fig. 17, delineato).

Fig. 12. *Macrozamiæ Fraseri* endospermium longitudinaliter apertum cum embryone, cujus radiculæ exsertæ apparatus proembryonis exsiccatus adhæret (e semine Tab. XCI. fig. 15 et 17, delineato).

Fig. 13. Endospermium *Cycadis mediæ*, longitudinaliter apertum, cum embryone et suspensoris parte.

Fig. 14, 15. Carpophylla a facie antica et a latere, post florationem, quorum ovula vel exsiccata vel viva tumidaque. ('Linnæa,' vol. xxv. tab. ii. fig. 3, 5.)

NEW BRITISH LICHENS.

By the Rev. James Crombie, M.A., F.G.S.

(*Continued from page* 51.)

No. II.

In addition to those species recorded in a previous number of this Journal, as having been recently detected by me in Great Britain, the following have now to be enumerated. With two exceptions they were gathered last autumn in the Highlands of Braemar and the maritime tracts of Kincardineshire, and have been duly noticed by Dr. Nylander in the 'Flora' for 1868 and 1869.

1. *Spilonema Scoticum*, Nyl.; thallus black, forming small, compact, convex, pulvinate patches; apothecia black, very minute, the epithecium impressed or convex; spores 8 in thecæ, colourless, oviform-oblong, 1-septate, 0·010–14 mm. long, about 0·0045 mm. thick, paraphyses discrete, slender; epithecium vaguely obscure, hypothecium colourless; hymeneal gelatine blue with iodine.

On micaceous rocks of Ben Lawers, above Loch-na-Cat. August, 1867. Rare, and but sparingly fertile. It is allied to *S. revertens*, Nyl., but is sufficiently distinguished by the size of the apothecia, and the character of the spores.

2. *Collema lichinodeum*, Nyl. in litt.; thallus linear-laciniated, small, the laciniæ obtuse and turgid at the apices, which are twice or thrice divided; the thallus internally nearly as in *Ephebæ*, but with different gonimia (although in colour almost corresponding), these being small, and often joined in moniliform alveolæ; apothecia unknown.

On schistose soil in crevices of rocks, and amongst decayed mosses on boulders on the summit of Ben Lawers. August, 1863. This somewhat peculiar species was first discovered by the late Rear-Admiral Jones, and subsequently gathered by myself and Mr. Carroll. It occurs in fair quantity, but without the least trace of apothecia, and

though its discovery has been recorded by Mr. Carroll in this Journal, it has not hitherto been anywhere described.

3. *Lecidea lithophiliza*, Nyl.; thallus greyish-white, firm, unequally deplanate, areolate-diffractate or areolate-rimose, thin; apothecia brownish-black, brown when moist, somewhat plane or convex, immarginate, white within; spores 8 in thecæ, colourless, oblong, simple, 0·009–0·017 mm. long, 0·0035–0·0045 mm. thick; paraphyses of medium thickness, livid-brown at top; hypothecium chalky-white in the middle, and black in the lower stratum; hymeneal gelatine distinctly blue with iodine.

On micaceous stones of a wall near Portlethen, in Kincardineshire, south of Aberdeen. August, 1868. Though plentiful in one spot, I vainly searched for it elsewhere in that neighbourhood. Its specific name would seem to indicate its propinquity to *L. lithophila*, Ach., a species common on the granitic mountains of Braemar, but Nylander observes, that it ought rather to occupy a place amongst the *Biatoræ*, near to *L. phæops*, Nyl., a plant of Ben Lawers and Cader Idris.

4. *L. sarcogyniza*, Nyl.; thallus obscurely greyish-green, or subolivaceous, opaque, thin, indeterminate; apothecia black, plane, marginal, the margin usually flexuose, obscure within; spores 8 in thecæ, colourless, oblong, 0·007–0·011 mm. long, about 0·003 mm. thick; thalamium colourless, paraphyses of medium thickness, club-shaped, and blackish at apex; hypothecium under the hymenium distinctly brown; perithecium blackish or black.

On quartzose stones of wall by railway, a little beyond the Bay of Nigg in Kincardineshire. August, 1868. Apparently very rare, but may be found elsewhere in that district, as it is very apt to be overlooked as a mere state of *L. lithophila*. The plant follows the depressions and chinks in the stones.

5. *L. commaculans*, Nyl.; thallus brownish-black or black, thin, subareolate, depressed, usually scattered, indeterminate; apothecia black, small, convex, scarcely margined, concolorous within; spores 8 in thecæ, colourless, oblong, 0·008–0·011 mm. long, 0·003–4 mm. broad; paraphyses not discrete, epithecium blackish, hypothecium thickish, reddish-brown; hymeneal gelatine blue with iodine.

On hard felspathic boulders of Morrone, in Braemar. August, 1868. Apparently rare towards the north-west brow of the mountain, amongst heaps of broken rocks, and, from the nature of the stone,

specimens were with difficulty obtained. Its systematic place is near *L. dispansa*, Nyl., from which it is well distinguished by the above characteristics.

6. *L. aphanoides*, Nyl.; thallus obscurely olive-grey, thin, subverrucose or subgranulose, unequal, indeterminate or subevanescent; apothecia black, small, convex, immarginate, naked, white within; spores 8 in thecæ, colourless, elliptical, simple, 0·009–0·013 mm. long, 0·0045–0·0055 mm. thick; paraphyses not discrete; thalamium bluish, hypothecium colourless, or vaguely reddish below; hymeneal gelatine blue, and then violet-reddish with iodine.

On calcareous rocks of Craig Guie, near Crathie Church, in Braemar. August, 1868. Apparently rare, and gathered only very sparingly beside the limestone quarry. It is allied to *L. aphana*, Nyl., a species found in Ireland by Mr. Carroll, both belonging to the group of *L. furvella*, Nyl.

7. *L. melaphana*, Nyl.; thallus black, thin, opaque, unequal, somewhat diffractate; apothecia black, small, convex, immarginate, obscure within; spores 8 in thecæ, colourless, oblong, simple, 0·011–19 mm. long, 0·0045–0·0055 mm. thick; paraphyses not discrete, epithecium with the upper portion of thalamium blue, hypothecium slightly brownish below; hymeneal gelatine blue with iodine, and then partly of a violet colour.

On granite boulders of Craig Guie, in Braemar. August, 1868. Like the preceding, to which it is closely allied, this species occurred but in very small quantity amongst the boulders which lie thickly scattered on the lower slope of the hill. In both the specimens gathered, it was associated with *Lecanora fuscata*, var. *Sinopica.*

8. *L. inserena*, Nyl.; thallus obscurely cinereous, rimoso-areolate, the hypothallus black, visible or denudate; apothecia somewhat tumid, black within; paraphyses not discrete, epithecium bluish-brown, hypothecium with white opaque stratum beneath; spores ellipsoid-oblong, 0·014–17 mm. long, 0·006–8 mm. thick; hymeneal gelatine blue with iodine.

On calcareous rocks of Craig Guie, in Braemar. August, 1868. This species, which belongs to the group of *L. tenebrosa*, Flot., occurs also on Morrone, according to specimens in my herbarium gathered there in 1861, but not correctly named.

In addition to these, I may here notice the two following subspecies, only one of which, however, is a new one :—

Lecanora badia, picea* (Dicks.), Nyl. This differs from the type by the thallus and the apothecia being pitch-black, spores oblong, 0·009–0·011 mm. long. It is evidently *Lichen piceus* of Dickson's Crypt. Fasc. 4, p. 22, t. 12, fig. 5, but does not appear to have been noticed since as a British Lichen, till I gathered it last autumn on Morrone.

Lecidea ocellata, præponens*, Nyl.; thallus yellow, areolate or granulate-verruculose, apothecia subinnate, rugulose, immarginate; spores 0·015–7 mm. long, 0·008–0·010 mm. thick. Not uncommon on stones of the railway wall between Nigg and Cove, on the coast of Kincardineshire, south of Aberdeen. July, 1868.

ON THE FLORA OF SKYE.

By M. A. Lawson, Esq., M.A.,
Professor of Botany, Oxford.

Notwithstanding the number of people who yearly travel through the Isle of Skye, there has never yet appeared any published list of its indigenous plants. The following, while it makes no pretensions to completeness, may, it is hoped, afford to future travellers in those regions some assistance in determining what species are new, and what to be expected.

Our party consisted of Professor Oliver, Mr. Fox, and myself; and our stay in the island a fortnight, the last week in July and the first of August. We took the steamer from Glasgow to Portree; thence by a small boat to Steinscholi, a little village situated a short distance from Loch Staffin, a shallow bay in the north-east of Skye. From this place we botanized the Quirang and Storr, together with the range of mountains stretching between the two.

Thence by Uig to Dunvegan, which we made our head-quarters while investigating the botanical treasures of M'Leod's Tables, Dunvegan Head, and the woods surrounding the castle.

From Dunvegan we journeyed by mail to Sligachan, and, while there, devoted two days to the Coolins, and two to the red cone and ridge of Glamaig and Glamer. One day at Broadford, and three at Kyle Akin, finished our tour.

The following are the results which a comparison of our list with

Mr. H. C. Watson's records of the same or neighbouring districts has afforded :—

The total number of species in our list is 389, and of these

1st. 120 have never been recorded from the "Outer Hebrides."

2nd. 51 have never been recorded from the "Inner Hebrides," *i. e.* including Islay, Mull, Skye, and the neighbouring islands.

3rd. 31 have not yet been recorded from the "Inner Western Highlands," including West Inverness, Argyll, etc.

Lastly. 56 species have been recorded from the "Outer Hebrides," by Professors Babington and Balfour, that we did not find in Skye; but many of these we, no doubt, should have found had our stay been longer in the island.

This, be it remembered, is only the result of a hurried walk through the tourist-trodden Skye. It follows that the less frequented islands, such as Islay, Mull, and many others, would yield still greater results to a careful search.

Thalictrum alpinum.
Anemone nemorosa. Portree and Sligachan.
Ranunculus Flammula.
R. Flammula, var. reptans.
R. repens.
R. acris.
Caltha palustris.
Trollius Europæus.
Nymphæa alba. Sligachan and the neighbourhood.
Corydalis claviculata. Kyle Akin.
Nasturtium officinale. Broadford and Kyle Akin.
Arabis petræa.
Cardamine sylvatica.
C. hirsuta. Steinscholl.
C. pratensis.
Sisymbrium thalianum.
Sinapis arvensis.
S. alba. Uig.
Draba incana. Quirang and Storr.
Cochlearia officinalis.
Capsella Bursa-pastoris.
Viola palustris.
V. sylvatica.
V. tricolor.
Drosera rotundifolia.
D. intermedia. Steinscholl?
D. Anglica.
Parnassia palustris. Fells between the Storr and Steinscholl.
Polygala vulgaris.
Silene maritima.
S. acaulis. Quirang, Storr, and Coolins.
Lychnis Flos-cuculi.
L. diurna.
Sagina procumbens.
S. subulata. Dunvegan and Sligachan.
S. nodosa. Loch Sligachan and Broadford.
Honkeneja peploides.
Cherleria sedoides. Abundant on the range of mountains between the Storr and Quirang.
Stellaria media.
S. graminea. Portree.
S. uliginosa.
Cerastium glomeratum.
C. triviale.

C. alpinum. Coolins.

Tilia Europæa. Planted in woods about Dunvegan.

Hypericum quadrangulum.

H. pulchrum.

Acer Pseudo-platanus. Plantations.

Geranium molle. Broadford.

G. Robertianum.

Linum catharticum.

Oxalis Acetosella.

Ulex Europæus. Orbost, Broadford, Kyle Akin.

Sarothamnus scoparius. Orbost, Broadford, Kyle Akin.

Trifolium pratense.

T. medium.

T. repens.

Lotus corniculatus.

Anthyllis Vulneraria.

Vicia hirsuta.

V. Cracca.

V. sepium.

V. sativa.

Lathyrus pratensis.

L. macrorrhizus.

Prunus Padus. Kyle Akin.

Spiræa ulmaria.

Alchemilla vulgaris.

A. arvensis. Steinscholl.

A. alpina.

Potentilla anserina.

P. Tormentilla. Said to be used for tanning nets.

Comarum palustre.

Fragaria vesca.

Rubus Idæus.

R. cordifolius. Broadford.

R. umbrosus, *Arrh.* Loch Staffin.

R. corylifolius. Dunvegan.

R. cæsius.

R. saxatilis.

Geum rivale.

Rosa spinosissima. Dunvegan Head, Sligachan, Kyle Akin.

R. tomentosa.

Cratægus Oxyacantha. In various places, especially in the south of the island; apparently generally planted.

Epilobium angustifolium. Rocks facing the sea, Steinscholl.

E. parviflorum.

E. montanum.

E. tetragonum.

E. palustre.

E. anagallidifolium. Common on the mountains, especially in the south of the island.

E. alsinifolium. Quirang and Storr, Coolins.

Circæa alpina. Quirang, close to the sea at Steinscholl, Kyle Akin.

Myriophyllum alterniflorum.

Montia fontana.

Lepigonum marinum.

Spergula arvensis.

Sedum Anglicum.

S. Rhodiola.

Ribes spicatum, *Robs.* Uig, rocks about Dunvegan Head, abundant.

Saxifraga stellaris.

S. aizoides. Quirang and Storr.

S. hypnoides.

S. nivalis. Quirang and Storr.

S. oppositifolia. Quirang and Storr.

Chrysosplenium oppositifolium.

Hydrocotyle vulgaris.

Sanicula Europæa. Dunvegan, Sligachan, Kyle Akin.

Apium graveolens.

Ægopodium Podagraria. Dunvegan, Kyle Akin.

Bunium flexuosum.

Œnanthe crocata.

Haloscias Scoticum. Steinscholl.

Angelica sylvestris.

Heracleum Sphondylium.

Daucus Carota.

Torilis Anthriscus.

Anthriscus sylvestris.

Hedera Helix.

Sambucus nigra. Generally in the vicinity of houses.
Viburnum Opulus. Sligachan.
Lonicera Periclymenum.
Asperula odorata. Sligachan.
Galium boreale.
G. Aparine.
G. verum. Bank, close to Dunvegan Castle.
G. saxatile.
G. palustre.
G. uliginosum.
Valeriana officinalis.
Scabiosa succisa.
Eupatorium cannabinum. Dunvegan Head.
Petasites vulgaris.
Tussilago Farfara.
Aster Tripolium.
Bellis perennis.
Solidago Virgaurea.
Achillea Ptarmica.
A. Millefolium.
Anthemis nobilis. Steinscholl.
Matricaria inodora.
Chrysanthemum Leucanthemum.
C. segetum. Abounding in every cultivated patch of ground.
Artemisia vulgaris.
Tanacetum vulgare.
Gnaphalium uliginosum.
G. sylvaticum. Uig, Dunvegan.
Antennaria dioica.
Senecio vulgaris.
S. sylvaticus. Steinscholl.
S. Jacobæa.
S. aquaticus.
Saussurea alpina. Quirang, sparingly; abundant on the Coolins.
Arctium minus.
Centaurea nigra.
Carduus nutans. Broadford?
C. lanceolatus.
C. heterophyllus.
C. arvensis.
Lapsana communis.
Hypochœris radicata.
Apargia hispida.
A. autumnalis. Broadford.
Leontodon Taraxacum.
Sonchus oleraceus. Kyle Akin.
S. asper.
Crepis virens.
C. paludosa.
Hieracium Pilosella.
H. Anglicum. Orbost, Coolins.
H. iricum. Uig.
H. murorum.
H. vulgatum.
H. boreale. Steinscholl, Dunvegan.
Lobelia Dortmanna.
Campanula rotundifolia. Near Sligachan.
Arctostaphylos Uva-ursi. Storr, Quirang, Coolins.
Calluna vulgaris. Abundant on the limestone about Broadford and Kyle Akin.
Erica Tetralix Ditto.
E. cinerea.
Vaccinium Myrtillus.
V. Vitis-Idæa.
V. Oxycoccus. Loch Brittle, Dr. Webster.
Pyrola secunda. Sligachan.
Ilex Aquifolium. Sligachan, Kyle Akin.
Gentiana campestris.
Menyanthes trifoliata.
Lycopsis arvensis. Between Steinscholl and the Storr.
Myosotis cæspitosa.
M. arvensis.
Digitalis purpurea.
Scrophularia nodosa.
Melampyrum pratense.
Mimulus luteus. Naturalized in woods and ditches about Dunvegan; also in many open marshy places between Sligachan and Broadford.
Rhinanthus Crista-galli. Ditto.

Euphrasia officinalis. Ditto.
E. Odontites. Ditto.
Veronica scutellata. Steinscholl.
V. Beccabunga.
V. Chamædrys.
V. montana. Dunvegan.
V. officinalis.
V. serpyllifolia.
V. arvensis.
Mentha aquatica.
Thymus Serpyllum.
Scutellaria galericulata. On the shores of Salt lochs, etc. Steinscholl, Uig, and Scavaig.
Prunella vulgaris.
Lamium purpureum.
Galeopsis Tetrahit.
G. Ladanum. Steinscholl.
Stachys Betonica. Steinscholl.
S. sylvatica.
S palustris.
S. arvensis.
Teucrium Scorodonia.
Ajuga reptans. Dunvegan, Sligachan, Kyle Akin.
Pinguicula vulgaris.
P. Lusitanica.
Utricularia minor. In brackish pools near Steinscholl; abundant about Sligachan.
Primula vulgaris.
Lysimachia nemorum.
Glaux maritima.
Samolus Valerandi. Loch Scavaig.
Armeria maritima.
Plantago maritima.
P. lanceolata.
P. major.
Littorella lacustris.
Suæda maritima. Loch Ainort, Kyle Akin.
Salicornia herbacea. Loch Ainort, Kyle Akin.
Atriplex deltoidea.
Rumex conglomeratus.
R. obtusifolius.
R. crispus.
R. Acetosa.
R. Acetosella.
Oxyria reniformis.
Polygonum viviparum. Storr; Coolins.
P. Persicaria.
P. Hydropiper. Broadford; Kyle Akin.
P. aviculare.
Empetrum nigrum.
Euphorbia Helioscopia. Broadford; Kyle Akin.
E. Peplus.
Mercurialis perennis. Loch Brittle, Dr. Webster.
Callitriche platycarpa.
Urtica dioica.
Ulmus montana. Planted in groves.
Salix aurita.
S. repens, *var.* argentea.
S. herbacea.
Populus tremula.
P. nigra. Planted in groves.
Myrica Gale.
Betula glutinosa.
Alnus glutinosa. Dunvegan, Kyle Akin.
Fagus sylvatica.
Quercus Robur.
Corylus Avellana.
Juniperus nana.
Pinus sylvestris. In plantations.
Orchis latifolia. Loch Ainort.
O. maculata.
Gymnadenia conopsea. Steinscholl.
Habenaria viridis. Quirang.
H. chlorantha. Steinscholl.
Listera cordata. Kyle Akin; in dense woods.
Malaxis paludosa. Sligachan; plentiful.
Iris Pseudo-acorus.
Allium ursinum. Amongst fallen rocks on the coast at Steinschöll, and other places.

Endymion nutans.
Eriocaulon septangulare. In many of the lochs and peat pools about Sligachan.
Narthecium ossifragum.
Juncus effusus.
J. conglomeratus.
J. triglumis. Storr and Coolins.
J. biglumis. Sparingly on the range of mountains between the Storr and Quirang.
J. trifidus. Coolins.
J. lamprocarpus.
J. supinus.
J. squamosus.
J. compressus. Loch Ainort.
J. Gerardi.
Luzula sylvatica.
L. campestris.
L. spicata. Tops of the mountains about the Storr and Sligachan.
Triglochin maritimum.
T. palustre.
Sparganium ramosum. Steinscholl.
S. natans.
Lemna minor. Uig.
Potamogeton polygonifolius.
P. heterophyllus.
P. perfoliatus. Steinscholl.
Schœnus nigricans.
Rhynchospora alba.
Eleocharis palustris.
E. multicaulis. Steinscholl.
Scirpus maritimus. Uig.
S. lacustris.
S. cæspitosus.
S. fluitans. Sligachan, Kyle Akin.
Blysmus rufus.
Eriophorum vaginatum.
E. angustifolium.
Carex pulicaris.
C. pauciflorus. M'Leod's Tables.
C. vulpina. Uig.
C. stellulata.
C. ovalis.
C. vulgaris.
C. pallescens. Dunvegan, Kyle Akin.
C. panicea.
C. limosa. Sligachan.
C. pilulifera.
C. glauca.
C. flava.
C. binervis.
C. ampullacea.
Phalaris arundinacea.
Anthoxanthum odoratum.
Phleum pratense. Uig, Sligachan, Kyle Akin.
Alopecurus pratensis. Steinscholl, Uig.
A. geniculatus.
Nardus stricta.
Phragmites communis.
Agrostis vulgaris.
A. alba.
Holcus mollis. Dunvegan.
H. lanatus.
Aira cæspitosa.
A. flexuosa.
A. caryophylla. Dunvegan, Kyle Akin.
A. præcox.
Avena pratensis. Uig.
Arrhenatherum avenaceum.
Triodia decumbens.
Mollinia cærulea.
Poa annua.
P. nemoralis.
P. trivialis.
P. pratensis.
Glyceria fluitans.
Catabrosa aquatica. Broadford ?
Cynosurus cristatus.
Dactylis glomerata.
Festuca ovina.
F. rubra.
Serrafalcus mollis. Uig.
Brachypodium sylvaticum. Dunvegan, Kyle Akin.
Triticum repens.
T. repens, var. littoreum. Steinscholl.
Lolium perenne.

Equisetum arvense.
E. maximum. Steinscholl.
E. sylvaticum.
E. palustre.
E. limosum.
Cryptogramme crispa. Coolins, Broadford, Kyle Akin.
Polypodium Phegopteris.
P. Dryopteris. Orbost, Kyle Akin.
P. vulgare.
Lastrea Oreopteris.
L. Filix-mas.
L. dilatata.
L. æmula. Kyle Akin.
Polystichum Lonchitis. Quirang and Storr.
P. aculeatum.
Cystopteris fragilis.
Athyrium Filix-fœmina.
Asplenium Adiantum-nigrum.
A. Trichomanes.
A. marinum.
A. Ruta-muraria. Sligachan, Kyle Akin.
Blechnum boreale.
Pteris aquilina.
Hymenophyllum Wilsoni.
Osmunda regalis. Orbost, Loch Scavaig ?
Botrychium Lunaria. Quirang.
Pilularia globulifera. Steinscholl.
Lycopodium clavatum. Storr, Dunvegan.
L. alpinum.
L. Selago.
L. selaginoides.
Chara flexilis.
C. hispida.

DE NOVA *RHAMNI* SPECIE.

Auctore H. F. Hance, Ph.D., etc.

Rhamnus (Frangula) oreigenes, n. sp.; inermis, cortice cinereo-purpureo, ramulis petiolis pedunculis pedicellisque tomento denso flavido-cinereo obtectis, foliis alternis subcoriaceis breviter petiolatis subbipollicaribus circ. 10 lin. latis e basi obtusiuscule cuneata obovatis subito caudato-acuminatis minute crenato-serrulatis crenis apice glandulosis versus folii apicem magis approximatis atque conspicuis supra præter venas pilosulas pilosque in lamina sparsos demum glabratis subtus dense cinereo-tomentosis costulatis costulis utrinque 7–8 cum costa subtus prominulis margine ipso arcuatim conjunctis, floribus axillaribus 3–8 subumbellatim dispositis, pedunculo petiolo subæquali pedicellis paulo breviore, calycis tomentosi tubo campanulato lacinias semiovatas acutiusculas erectas intus fortiter carinatas adæquante, petalis cucullatis ex ungue brevi obcordatis (apice nempe sinu latiusculo semibifidis) stamina æquantibus laciniis calycinis duplo brevioribus, filamentis crassis complanatis, antheris didymis æquilongis, stylo simplici ovario globoso 3–4-loculari parum longiore sursum 3–4-sulcato apice inconspicue 3–4-lobo papilloso apices filamentorum attingente, ovulis minutissimis luteis non sulcatis basi emarginatis, fructu . . . ?

In herbosis ad cacumina montium Pakwan, supra Cantonem, ipse legi, d. 12 Julii 1867 (Exsicc. n. 14,113).

Plantam nostram, indumento foliorumque forma certe distinctissimam, non tantum cum speciebus continentis Indiæ et Zeylaniæ, sed etiam cum plerisque earum ab amico Maximowiczio, in egregia commentatione 'De Rhamneis Orientali-Asiaticis' * recensitarum, comparavi. Fructu licet etiamnum ignoto, de sectione,—habitu, stylo indiviso, ovulorumque fabrica (difficile ob minutiem tandem explorata) ponderatis,—minime dubito; ac inter commilitones probabiliter magis *R. Frangulæ* nostrati quam aliis est affinis, nisi forte *R. grandifoliæ*, F. et M.,—mihi quidem non notæ,—propior. Petala fere qualia *R. carolinianæ* a Spragueo depicta (A. Gray, Gen. Pl. U. S. ii. tab. 167), sed sinu profundiore ac paulo angustiore lateribusque extus magis oblique truncatis invenio.

NOTE ON *DELIMA*, *Linn.*

By H. F. Hance, Ph.D.

Bentham and Hooker, in the 'Genera Plantarum,' retain the genus *Delima*, distinguishing it from *Tetracera* by its 2–3 ovules and solitary carpel. But *Delima sarmentosa*, as remarked by Planchon and Triana (Ann. Sc. Nat. 4me sér. xvii. 20), has very frequently a large number of ovules, as I have repeatedly observed; and it was, indeed, from noticing this circumstance, and relying on the accuracy of the character assigned to *Delima* by authors, that fifteen years ago, when my acquaintance with plants was far more limited than at present, I described the plant under the name of *Leontoglossum*. Since, moreover, several genuine *Tetraceræ* have only 3 or 4 ovules, whilst in others they are indefinite, and *T. sessiliflora* and *T. (Delimopsis) hirsuta* have a solitary carpel, it is manifest that these genera must be reunited, as proposed by Planchon and Triana.

* Dolendum est, hac in laudatissima diatribe, virum ornatissimum, casu quodam *R. utilem* et *R. chlorophoram*, a docto Decaisneo in Rondotii opusculo quod inscribitur 'Notice du Vert de Chine' descriptas, ibidemque a solerti Riocreuxii manu nitide depictas, omnino prætermisisse.

NOTE ON THE CHINESE NAME OF *ELEUSINE CORACANA*, *Gærtn.*

By H. F. Hance, Ph.D.

In the neighbourhood of Canton, where this cereal is sometimes sparingly cultivated, the common native name, as obtained from the peasantry by Mr. Sampson, is *Kai-keuk-kuk*, literally "fowl's-foot grain." I have thought this worth noting, because, by a curious coincidence, the closely allied *Eleusine Indica* bears in Spain, according to Willkomm (Prodr. Fl. Hisp. i. 46), a precisely similar name,—"Pié de gallo."

These are various instances of similar nomenclature amongst *Gramineæ, e.g.* our own "Cock's-foot grass" (*Dactylis*), and *Leptochloa arabica*, Kunth, which, according to Bertoloni (Fl. Ital. i. 579), is called "Pie di gallo raspellone" in Italy; but in no genus is the popular term so appropriate as in *Eleusine*, and it is, doubtless, to this circumstance that we must ascribe the coincidence just alluded to.

NOTE ON *HYGROPHORUS CALYPTRÆFORMIS.*

The first time that I met with this beautiful *Hygrophorus* was in November, 1847, when a few specimens of it were growing on the mossy lawn at Wick House, between Brislington and Bristol, a station which, as far as I know, remains undisturbed, although the Hanham one is destroyed. I showed my drawing of it at the time to the late Mr. H. O. Stephens, but he could give me no information respecting it, and it was not till some years later that I learnt its specific name. Since then I have seen it three several seasons, and in three different localities near Kenilworth. Is it, therefore, so rare a species as is supposed? The last time I met with it was in 1866, but I never saw more than a few plants in each spot. It is very lovely, and might almost be mistaken, at a little distance, for buds of *Colchicum autumnale*, so pure and delicate is its colour.

Anna Russell.

Kenilworth, March 10*th*, 1869.

A BOTANICAL TOUR AMONG THE SOUTH SEA ISLANDS.

BY WILLIAM R. GUILFOYLE.

[We are indebted to the kindness of our correspondent, Dr. F. von Mueller, for a copy of the following very interesting narrative.—Ed.]

I.

On the twenty-fourth day of May last we left Sydney in H.M.S. Challenger, Commodore Lambert, C.B., for a cruise among the islands of the South Pacific. During the whole of the trip we experienced calm and delightful weather, with the exception that at the Samoas we found it excessively hot.

Our first anchorage was in the delightful harbour of Pango-Pango, in the island of Tutuila, Samoas. Nothing could be more delightful or beautiful than this place. The landlocked harbour has all the appearance of a lake—the charms of which are heightened by lofty precipitous mountains, densely clothed with the most luxuriant vegetation. Soon after we had anchored I went ashore with the Commodore and several of the officers (whose kindness to me during the cruise I shall never forget), but, as it was getting late, we contented ourselves by walking through several provision-grounds, which were enclosed with walls, four or five feet in height, built of pieces of scoria and stone of various kinds. In many of the islands the provision-grounds, or gardens, often extend over ten or twelve acres; they contain cocoa-nut, bananas, plantains, yams, taro, and everything useful as food. In Tutuila I was struck with the richness of the vegetation, and with the great depth of volcanic soil. The graceful Cocoa-nut Palm (*Cocos nucifera*) is here very abundant in the villages, in fact, it is plentiful in all the islands, and it is well known that where this beautiful plant is to be found, it betokens the presence of native habitations. I left the ship early the next morning, with the full determination, knowing that our stay would be short, of going as far inland as possible. A young officer accompanied me, and taking with us four natives, we commenced to ascend the mountain steeps, and after a difficult ascent through thickets of *Carica Papaya* (Papau Apple), *Citrus Limonum*, and Plantains, occasionally interspersed with *Aleurites triloba*, *Cocos*, and some interesting Araliaceous plants, *Phaseolus albus*, and several species of *Ipomœa*, matted with, and growing over, the decaying vegetation and blocks of scoria; we reached a cultivated patch of Taro (*Arum esculentum*), about 700 feet above the level of the sea. Here we sat to rest under a Breadfruit-tree (*Artocarpus incisa*), the grateful shade of which was much needed. I noticed even on the tops of those precipitous mountains, which are 1500 feet above the level of the sea, several fine specimens of the Cocoa-nut. Along the valleys, and upon some of the low ridges, two species of *Sida* were often conspicuous objects. An *Æschynanthus* and a species of *Niphobolus* were to be found upon the stems of the *Calophyllum*, *Inocarpus*, and on many of the larger trees, in such thick masses as to hide them from view. An *Indigofera*, together with a *Gossypium*, and several varieties of *Saccharum*, would some-

times form an impenetrable mass, especially when an *Ipomœa*, of which I noticed several species, had found its way into the midst of them. Among the Ferns, *Nephrodium*, *Nephrolepis*, *Asplenium*, *Pteris*, and *Lomaria*, were more plentiful upon the mountain sides, while groups of *Marattia elegans*, and a species of *Alsophila*, were common in moist places

Our next anchorage was at Apia Upolu, which is also one of the Samoan group. Here the vegetation is much the same, and the natives quite as mild and good-humoured in aspect as those at Tutuila. Although the weather was exceedingly warm, I had some very pleasant walks during our stay at Apia, and through the kindness of H.M. Consul (Mr. Williams) and the missionaries, who sent guides with me into the interior, I experienced no difficulties, save the work of travelling up and down the steep mountains, which is often rendered less laborious by the many trailers and climbers that hang around almost every stem, and which enables one, by catching hold, to pull up or lower himself down at pleasure. The *Artocarpus incisa* is more plentiful in Upolu than in any other island we visited, and there are said to be there sixteen sorts of that useful and ornamental plant. This I cannot doubt, when in a walk of twelve miles I met with eight distinct varieties. In a valley near to the cascade grew one of the finest specimens I have ever seen. The leaves, which are not incised, measured two feet by eighteen inches in width. The fruit was not so large as that of some of the other varieties, but the foliage and the form of the tree were truly magnificent. In the island of Tana, New Hebrides (of which I shall speak in due course), about five miles in a north-easterly direction, I found an immensely large fruiting variety, and succeeded in getting a few young plants, which have arrived safely. The fruit measured exactly 18 inches in length, and 12 inches in circumference, while the tree itself was not more than 20 feet in height. But by far the largest Breadfruit-tree I have met with anywhere, was also in Tana; its trunk was 7 feet in circumference five feet from the ground, while it could not have been less than 65 feet in height. The Tannese, however, seem to care less for the fruit than any of the other islanders. At the Samoas and at Vavou it seems to be the principal diet. The refreshing green of its foliage, the large and beautiful fruits that hang down from its branches, together with the pleasant shade it affords, all contribute to render it one of the most attractive trees to be met with in the islands. At Upolu, as also in most of the islands, the *Inocarpus edulis*, or "South Sea Chestnut," is to be found; but it is nowhere so plentiful as in the Fijis, where it often grows to a height of more than 50 feet. The trunk presents a very remarkable appearance, having projections like buttresses standing out from it on all sides, and extending from the root to the branches. The leaves are of a dark green, and the flowers, although small, are very fragrant. The fruit somewhat resembles a chestnut, and when roasted is much used as food by the natives. Near to the Breadfruit-tree, with fine foliage (described as being near to the cascades), were the finest specimens of *Inocarpus* I have met with. They presented a rather novel but beautiful appearance, being literally covered with *Dendrobiums*, of which there were three species. The beautiful *Sapindus pinnatus*, which is closely allied to, and not unlike the

Lichee of China, although a much larger and more delicious fruit, occurs here, as also in the Friendly Islands and the Fijis. It is called by the Samoans *Tava*, at Vavou (a group of the Friendly Islands) it is known as *Dava*, and in the Fijian dialect *Dauva*. When first I met with the tree at Upolu, I was standing on the side of a mountain ; a beautiful specimen, about 45 feet high, was towering above the dwarf, but pretty shrubs that surrounded it in the valley beneath. Not knowing at the time that a great peculiarity of the tree is its fiery red, immature leaves, which, contrasted with the grassy-green of the full-grown ones in the distance, are really charming, more especially when the dense foliage of a *Calophyllum*, or a *Eugenia Malaccensis*, forms a background,—I quickly descended, thinking that I had discovered something new. My native guides kept close to me, saying, *Tava tava*, at the same time putting their hands to their mouths and smacking their lips, to signify that the tree I so eagerly rushed to, bore an edible fruit. *Eugenia Malaccensis* is also an excellent fruit, and, like *Sapindus pinnatus*, it is to be found in most of the South Sea Islands. I have seen several fine varieties of it in the Fijis, very different from the one called Fekeka in the Samoas, and which I believe is the same as the one at Vavou, Friendly Islands, called Fegéka. At Burretta, the private residence of Mr. Thurston, H.M. Consul at Fiji, my attention was called to a scarlet and a yellow fruiting variety growing side by side, and both had flowers corresponding in colour with their fruit, which were the same in size and taste, and the trees themselves were about the same height. The Vi-apple (*Evea dulcis*) seems to be more plentiful in Upolu than in most of the islands ; it is an excellent fruit, and a very ornamental tree. Some very fine specimens of it occur in the mountains above Apia, and at the time of my visit the ground was strewed, even for a distance, with their delicious fruit, which is of a golden-yellow colour, perfectly oval, very juicy, and weighs generally about three-quarters of a pound. The tree bears two crops in the year. The Plantain and the Banana are common almost everywhere. *Musa Cavendishi*, of China, which I have found in many of the islands, Mr. Williams, H.M. Consul at Samoa, informed me was first introduced by his father (the Rev. John Williams), from the Duke of Devonshire's garden many years ago. It has been introduced into most of the islands by native missionary teachers. There are a great many varieties of the Plantain and the Banana among the islands, and there were at least twenty-five kinds among those we visited. I met with a very remarkable species in a plantation in the Fijis. The foliage was of a rich purple, and had a most beautiful effect, mingled with the variegated foliage around. I attempted to take up a small plant of this beautiful variety, but was immediately prevented by the natives. Tobacco, calico, and even money, were offered for it, but to no purpose. I afterwards learnt from a settler, that it is customary with the Polynesians to plant ornamental foliage near to their houses in honour of their deceased relatives, and that to break one of those plants is considered an atrocious crime, punishable by death. I recollect, at Tutuila, having attempted to pull up a small plant of *Aralia*, near to a village, when a young chief rushed forward, bawling as loudly as possible, *Tabu tabu* (forbidden), and from his excited appearance I should think that,

had not the Commodore and some of the officers been present, he would have attempted to handle me roughly. Another fact worthy of notice is, that the natives of many of the islands—and particularly those of Tana and Vate, New Hebrides—ornament their houses by planting around them the prettiest variegated plants they can find. Crotons and Dracænas are great favourites with them, as also are plants with strong perfume, such as the Evodia, and others. It may appear strange to some that even those naked savages have a taste for the ornamental and beautiful, but I believe that there is no one in existence who could, without a feeling of delight, pass by a group of those most striking of all variegated plants, the Crotons and Dracænas. No bouquet could produce a more varied display of brilliancy than I have seen in them. Imagine what a dazzling effect a Croton must produce, from 12 to 15 feet in height, having a mass of foliage, striped or spotted with the most glowing colours,—bright scarlet, vermilion, or yellow, reticulated with purple, green, orange, or pink. The Dracænas, not less beautiful, are generally found upon the mountain slopes, and it is a strange fact, with regard to the latter, as well as with several other plants I have met with, that the coloured variety found in one spot may not be found elsewhere upon the island. There is no general distribution of any but the green varieties, and those occur in all the islands. The Samoas seem to be well suited for the growth of sugar and coffee. Rice and cotton, too, would thrive in certain situations. Mr. Williams, the Consul, has several extensive plantations of both. In the garden of the Rev. Fathers Rondelle and Violette (French missionaries), I noticed many other introduced plants growing to great perfection. Their garden is well worthy of mention. It occupies altogether about sixty acres, and is situated upon a rich alluvial flat. The Mango (*Mangifera Indica*), the Lichee (*Euphonia Lichee*), *Averrhoa Bilimbi*, *Achras sapota*, *Anona squamosa*, and many other beautiful fruits, were here thriving most luxuriantly. The *Vanilla aromatica* had climbed up the stems of many of the Breadfruit and Cocoa-nut trees with which this garden is studded. There is no very great display of artistic decoration in the garden itself, but it might justly be termed an Eden, from its picturesque situation; its running streams and small lakes; its avenues and groups of Breadfruit and Cocoa-nut; its plantations of Banana, and thickets of Pandanus. The growth of everything is exuberant. The prettiest hedge I have ever seen, surrounded a fancy-garden near the house, it was formed of a dwarf, bright scarlet, large, double-flowering *Hibiscus* (indigenous to the Samoas), about 4 feet high, which was literally covered with flowers, and presented indeed a gorgeous sight,—the glossy bright leaves occasionally peeping between the flowers. As we remained for nearly a week at Upolu, I was enabled to travel over a great portion of the island. The vegetation everywhere is indescribably rich, and consists principally of the Orders *Malvaceæ*, *Myrtaceæ*, *Tiliaceæ*, *Sapindaceæ*, *Guttiferæ*, *Araliaceæ*, *Aurantiaceæ*, *Leguminosæ*, *Liliaceæ*, *Euphorbiaceæ*, *Compositæ*, and *Urticaceæ*.

(*To be continued.*)

A BOTANICAL TOUR AMONG THE SOUTH SEA ISLANDS.

BY WILLIAM R. GUILFOYLE.

II.

In Vavau's beautiful harbour we next dropped anchor. Vavau is the only one of the Friendly Islands we visited. The harbour is an exceedingly picturesque place, and in this respect it may be second only to Pango Pango in Tutuila. The scenery charmed me much, although, in all my rambles—and I believe that I walked over the greater portion of the larger islands of this group—I found nothing very rare or new in the way of plants. Vavau is less mountainous, the surface having more of an undulating nature than any of the other islands. I think it would be admirably adapted for the growth of Cotton. In no other place have I seen the Cocoanut so abundant. There are six distinct varieties,—a fact which rather surprised me, as I had never heard of more than two. Having collected specimens, I soon obtained from the natives their respective names as follows:—*Niukafa*, a very large nut, the husk of which is about eighteen inches long; *Kafakula*, an almost round nut, the milk of which is very sweet; *Taokave*, a very small nut, the milk used only by the chiefs: the tree itself is much taller and more slender than any of the other varieties, and bears a much greater quantity of nuts, the average being eighty in one bunch; *Paagania*, nut of moderate size, but having a very thick shell, which the natives cut into round pieces about three or four inches in diameter, with which they play a game called "lafo;" *Niumea*, a very handsome variety, with a red husk; *Niule*, is the variety common throughout Polynesia, the nut is the same in size as the last, but of the ordinary colour, and is a remarkably strong grower. In a village about two miles inland I came across a species of Shaddock, bearing fruit of extraordinary size, averaging thirty inches in circumference, the rind one inch in thickness, and exceedingly bitter. Near a native burial-place, not far from Talau, the highest mount of Vavau, and which is only 400 feet above the level of the sea, I met with some very fine specimens of the beautiful *Barringtonia speciosa*, which is not common in Vavau, but is met with very frequently in the Fijis and the East Indies. Its compact spreading branches, thickly clothed with large dark green foliage and rich rosy-pink sweetly scented flowers, entitle it to a place among the more beautiful of ornamental trees. The ground is often covered for a considerable distance with its large quadrangulate seed-vessels, which, while in the green state, are used for poisoning fish. About a mile from the burial-place I was not a little surprised to find myself under the shade of a magnificent Tamarind-tree (*Tamarindus Indicus*) fully thirty-five feet in height. I inquired of some natives who could speak English tolerably well if they knew where the tree was brought from. They answered that "*Papelangi*"—"white man"—had put it there. Several varieties of the Orange-tree are plentiful about the villages, but the Tahitian predominates. There are also a Lemon and a Lime, the latter being the same species that I met with at the Samoas. The *Carica Papaya*, or "Papau apple" (often called "Mammey apple") is very abundant here. *Piper*

methysticum, the plant of which the *Kava* is made, is cultivated extensively; but in this, and in many other islands where missionaries have taken up their abode, the practice of drinking that beastly beverage has ceased much of late years. The under-scrub of Vavau consists principally of an *Arundinaria*, the reed of which the houses and fences (decidedly the neatest and best I have seen anywhere) are made. A *Phaseolus*, several species of *Ipomœa*, and a *Kenneydia* [? —Ed.] are to be seen trailing along and forming impenetrable masses over hundreds of acres. Sometimes they find their way into the plantations of *Broussonettia* (the plant of which "Tapa," or native cloth is made), and soon destroy them. The graceful Cocoa-nut towers majestically above, and waves its feathery fronds in the breeze, as if defying its enemies beneath. I found the vegetation more varied, with few exceptions, near to the water's edge, where Malvaceous, Rubiaceous, Araliaceous, and Leguminous plants seemed to be more numerous than others. I was taken all round this very delightful harbour in the French missionaries' boat, and was not only charmed with the scenery and the perfume of *Jasminum gracile*, occasionally resting itself upon the shrubs on the banks that margined the shore, but also with the fish and coral of all colours to be seen in its waters. The pretty *Paritium tiliaceum*, with its heart-shaped leaves and large golden-yellow flowers, a *Hernandia*, a *Calophyllum*, an *Erythrina*, and a *Casuarina* were among the vegetation that clothed the banks. An *Echites* and a white-flowering *Hoya* grow in such thick masses as to hide from view their helpless supporters. *Tacca pinnatifida*, of which the natives make arrowroot, was also plentiful. There were few Orchidaceous plants; a *Dendrobium* might, perhaps, be discovered in the midst of a bunch of *Drynaria*, upon a stump or in the fork of a tree, and occasionally a *Bletia* and a *Diuris* would be seen in the long grass. Growing around their habitations in the villages, the natives have many Fijian plants. Among the more conspicuous of these were the *Acalypha tricolor*, a *Euphorbiacea*, some Dracænas and Crotons, and the beautiful Palm *Pritchardia Pacifica*, whose bright green umbrageous fronds (the same in form but fully twice the size of *Latania Bourbonica* or *Corypha Australis*) might be seen in several places spreading gracefully over a native hut. Near to the chief's house (who, by the way, called himself the "governor") I saw a small plantation of a very fine species of Tobacco (*Nicotiana*), which is not indigenous to the island; some fine trees of *Cedrela velutina* of the West Indies were growing close by. A variety of *Mimosa sensitiva*, and *Quamoclit coccinea* (a well-known pretty little annual climber from South America) were to be found in patches about the villages; the latter was plentiful in a small garden in front of the governor's house. The governor, David ——, a fine-looking fellow about six feet two inches in height, is a son of old "King George," of Tongatabu, which is another of the Friendly Islands, a day's sail from Vavau. He can speak English very well, and I was surprised to find him so intelligent. His house is certainly worthy of inspection. It contains four rooms, is of simple but neat construction, being built of weatherboards and reeds, thatched with sugar-cane tops. In the principal room there was a handsome suite of furniture, which I learned had been brought from Sydney a few months previous

to our visit. It consisted of two tables, a sofa, some chairs, a chiffonier, and, if I mistake not, a Brussels carpet covered the floor. A large mirror, and some pictures representing sacred subjects, were hung over the mantelpiece, upon which were a few neat ornaments. When my friend and I were about to leave, "his Excellency" asked if we liked brandy or wine, and immediately placed upon the table two decanters, together with some new pipes and tobacco. He paid a visit to the commodore on the morning we left, he having only returned from Tonga the day before in his father's schooner. When he was leaving the ship he was honoured with a salute of seven guns, a mark of consideration with which he was highly delighted. It is due to the commodore to observe that the courtesy he invariably paid to the chiefs of the various islands seemed likely to engender good feeling and favourable relations. Respect and kindness, in whatever form, must tend to induce those uncivilized people to throw off their savage character, and aspire to a higher humanity. It was by the consideration and good will of previous visitors, together with assiduous missionary labour (and this has done more good than many credit) that the Governor of Vavau and his father, the King of Tonga, and the Friendly Islands generally, have advanced so far in civilization. The "governor" was decidedly the most civilized chief we met with during the cruise. The worst feature of Vavau is that it is badly watered. Notwithstanding this, however, it is always moist and fertile, owing to its rich soil, occasional showers, and the dews which fall at night.

A few days' steam took us safely to Ovalau, Fiji Islands. Our first port there was Levuka, and our next anchorage was at the mouth of the Rewa River, in Viti-levu, or Big Fiji. Levuka gives one but a very vague idea of the beautiful scenery of the Fijis, although I must say that the vegetation around it is rich; and, without doubt, the island of Ovalau contains a greater variety of plants than any place of its size in the Fijis. But one must go round to the other side of the island, and thence across to Bau and up the river if he wishes to see tropical verdure beautifully displayed. I was never more delighted, however, than with a trip to the island of Wakaya (eight miles to the windward of Ovalau), belonging to Dr. Brower, the American consul, who resides there, and who certainly deserves great praise for the manner in which he has turned his attention towards the growth of cotton, coffee, and sugar, which succeed admirably. His plantations of Sea-island cotton are extensive, and the quality the best I have seen anywhere. This paradise is seven miles long by two miles in greatest width. It is well watered by several running streams, and through its charming green hills and park-like forests may be seen several hundred head of fine cattle and sheep. They need neither stock-keepers nor shepherds, and, revelling in the best of pastures, they seem to be quite at home. The doctor informed me that eight years ago he introduced ten head of cattle, which have now increased to nearly two hundred head. He has several well-bred horses, as well as goats, pigs, and fowls in quantity.

I had some very laborious, though truly interesting, tours through the mountains of Ovalau. The highest peak here is said to be about 2080 feet, which I

managed to ascend with difficulty. The thickets of scrub, reeds, and climbers,—among the latter two species of *Smilax* and a *Rubus*,—were often exceedingly troublesome. Sometimes my guides and myself had to crawl upon our hands and knees, and, after an hour's work in getting through one of those labyrinths, tripping and tumbling over the rocks hidden in the long grass, trailers, and decaying vegetation, a huge mass of rock and scoria cemented perhaps would present itself. There was no other alternative but to surmount it, or to encounter the same ordeal of crawling back through the almost impenetrable mass previously passed. Although those huge walls of rock are often nearly vertical, yet, from the soft nature of the volcanic matter, a rank vegetation springs from every projecting ledge, and, but for the oft-recurring interstices, by the aid of which the natives clamber up with the agility of monkeys, it would be utterly impossible to scale those barriers, which are often more than eighty feet in height. Amongst the thickly-matted vegetation which clothes the mountains to their summits one meets with many fine species of *Ficus*, which are often of gigantic size, and rendered extremely beautiful by a large mass of *Polypodium diversifolium* in almost every fork and upon every branch. *Cassia occidentalis* and *C. obtusifolia*, together with several species of *Piper*, *Asclepias Curassavica*, *Plumbago*, *Phyllanthus*, and *Sida liniphylla* have spread themselves over large tracts along the ridges. *Morinda citrifolia* and *laurifolia*, whose large glossy green foliage often contrast beautifully with the purple heart-shaped leaves of *Paritium purpurascens*, are pleasing objects. *Paritium tiliaceum*, with its bright green foliage and yellow flowers, is not less beautiful, and occurs more frequently in the valleys or close to the shore. A species of *Eurya*, a *Coprosma*, a *Medinilla*, and a *Geissois* are very abundant upon one of the mountains overlooking the beautiful valley of Livone, in which place I met with four species of *Selaginella* growing so luxuriantly from the shade and moisture as to measure often five feet in height. Very abundant were varieties of *Asplenium*, *Darea*, *Davallia*, *Doodia*, *Nothoclena*, *Adiantum*, *Hypolepis*, *Pteris*, *Microlepis*, *Drynaria*, *Todea*, *Litobrochia*, *Polypodium*, *Nephrolepis*, *Nephrodium*, *Lomaria*, a *Lygodium*, a *Marattia*, and many other species of Fern. *Davallia Fijiensis* and a *Tradescantia* often clothed the rocks, and the former with a *Niphobolus*, an *Æschynanthus*, and a *Ramelina*, the stems of many of the larger trees, particularly the *Inocarpus edulis*, an *Elæocarpus*, or a *Calophyllum*. The stems and branches of *Lumnitzera* and *Thespesia populnea* were often literally hidden by a matting of *Niphobolus*, whose pendent ribbon-like fronds, hanging gracefully down, gave them a novel but beautiful appearance. Scarcely less singular and beautiful is the aspect of the larger trees when covered with a *Freycinetia*, of which I noticed two species, whose numerous tufts of lanceolate leaves up the stems and along the branches would suggest a climbing *Pandanus*, to which genus it is closely allied.

Two species of *Rhaphidophora* often occur in the same manner, quite eclipsing the trunks and branches of the larger trees. The *Pandanus* is rarely met with far inland, but is found generally close to the sea. Its strong aerial roots protruding from the stem and descending in succession towards the ground, bear on their tips a loose, cup-like coating, which preserves their absorbents from

injury until they reach the earth, in which they quickly bury themselves, and act as stays to prevent the stem being blown about by the wind. I was frequently startled during my walks, which were often long and tedious, though always interesting, by the rattling of the huge pods of *Mucuna gigantea*, or "Big Bean," which are often two feet in length, and as broad as one's hand. Occasionally on the *Inocarpus edulis*, "South Sea Chestnut," whose singular stem I have described, and also growing on the branches of *Artoca.pus incisa*, I have met with two species of *Loranthus* and a *Viscum*. These parasites are very interesting and ornamental.

I was struck with the beautiful and picturesque scenery at Burreta. From the consul's house (Mr. Thurston's), which is situated upon a hill from which a charming view may be had of the port of Ovalau, looking northwards, that wilderness of beauty in the valley of Livone,—a garden, in fact, with its towering Cocoa-nut-palms and lofty Ferns, together with clumps of Plantain and Banana studded about here and there, through the other rich and varied vegetation,—would alone present a truly magnificent picture. Turning round, the eye looks upon the long, low, and narrow but pretty island of Moturika, with its islets, distant a couple of miles, the big Fiji, "Viti-levu," being in the distance as a background; the unrippled surface between and beneath as a foreground is an expanse of vegetation of emerald green, margined with the white sandy beach and coral reefs, or by belts more or less broken of the never-to-be-forgotten *Cocos nucifera*.

Mr. Thurston's cotton plantations are among the best I have seen, great care having been taken to keep the various sorts of Cotton apart, a precaution which must be observed if one desires to have *good* varieties. It often happens that when the sorts are planted in too close proximity the pollen is transmitted from one to the other, and the result is of course hybrid between them. The settlers say that the hybrid is inferior to either. I cannot help thinking, however, that a very good sort of Cotton might be obtained between the Egyptian and the Sea-island. The silky substance of the one and the long staple of the other should make a good variety for commercial purposes.

Nearly everything might be grown in the Fijis. I noticed some very good vegetables in a settler's garden. Mr. Thurston's very excellent overseer (Mr. Lombergh) assured me that the Indian-corn frequently bears three crops in the season, and that there are often six cobs upon a single stalk. After leaving Burreta, I proceeded in the consul's boat up the Rewa river, the mouth of which is distant about forty miles. I was pleased to have so good an opportunity of seeing this part of Fiji, and I was not unsuccessful in my botanical explorations.

Twenty miles or more from the mouth the river is often more than a quarter of a mile in width, and along its banks are some extensive cotton and coffee plantations; among the more important of which are those of the Messrs. Storck. Sugar, too, in small cultivated patches, occurs in places.

For miles inland, along the river, the country is generally of an undulating nature, and the soil remarkably productive. It consists in many places of a mixture of pulverized volcanic rock and vegetable deposit, which, saturated

with the heavy dews at night and frequent showers, becomes extraordinarily fertile. Indeed, throughout my rambles in the Fijis I did not meet with an acre of land that might not be cultivated. The soil everywhere is covered with a dense mass of vegetation. During my ascent up the river I called upon several of the settlers, whom I found to be exceedingly kind, and through whose plantations I had the pleasure of walking.

With regard to cotton-growing upon the Rewa, I should think that it would be less remunerative than sugar; the heavy dews at night and the frequent showers occurring nearly every other day, cannot benefit cotton, especially during the season for gathering. On the other hand, sugar-cane is benefited by the rich soil and constant moisture. Perhaps it will be considered an exaggeration by some, but I was informed that it is by no means uncommon to see Sugar-cane growing to twenty-five feet in height. I myself measured a cane in Ovalau which was exactly twenty-two feet in length. In the windward islands, or close to the coast on the big lands, I have no doubt that cotton will pay the planter much better than sugar would at present.

Through the rich green mantle spread over hill and valley, on either side of this most delightful river, the Palms and Tree-ferns first catch the eye. The graceful Cocoa-palm is not to be seen, but its loss is compensated for by *Kentia exorrhiza* [*Veitchia*,—Ed.], and the beautiful *Pritchardia Pacifica*. The Cocoa-nut will seldom grow well far away from the sea, although in the island of Vate, one of the "New Hebrides," I found several fine specimens in a village about nine miles from the coast. Next in importance, the eye must rest upon the bouquet-like display of colour of certain flowers and foliage. The bright scarlet flowers of *Erythrina Indica* are often rendered still more brilliant by a mass of golden-yellow—the dying foliage of *Evea dulcis*, or the flowers of *Paritium tiliaceum*—the latter perhaps backed up by the dark beautiful green of a *Calophyllum*, a *Barringtonia*, or an *Inocarpus*. And by the side of *Sapindus pinnata*, with its fiery red shoots resembling spikes of flowers in the distance,—that finest of all tropical foliage when unbroken by the wind,—the Plantain's large grassy-green leaf often presents a charming contrast, especially when laden with its dense clusters of orange-coloured fruit. This gorgeous display of colour is rendered still more magnificent by the sombre green and purple tints of the distant hills and mountains in the background. Such is the landscape, and could anything be more beautiful? But a few hours cannot suffice to examine all the treasures beneath those gorgeous canopies. A hurried glance was my lot in places where I would have sacrificed much to have been able to remain for a day—nay, half a one.

In moist places, a short distance in from the banks of the river, such plants as *Coix Lachrima*, a *Canna*, an *Arundinaria*, a *Tradescantia*, *Vigna lutea*, *Smilax*, several species of *Ipomœa*, *Clerodendron inerme*, Dracænas, Crotons, Crinums, *Allocasia*, *Bletia*, *Angiopteris*, *Alsophila*, *Acrostichum*, etc. etc., are to be found in such exuberance, aided by the constant moisture, as to be almost impenetrable. In isolated spots, *Dioscorea alata* (Yam), *Jatropha Manihot*, and *Ipomœa Batatas* (Sweet Potato), are to be found in cultivated patches. I must say that even the wild Fijian teaches a lesson as regards the

culture of the first-mentioned vegetable. He generally chooses a spot in the flat or sometimes upon a gradual slope. Holes are dug with pointed sticks to some five or six feet in diameter, three feet apart, and about the same depth. The soil is pulverized and thrown back into the hole; some more soil is pulverized in the same way, thrown on top, and built up in the form of a cone to about three feet six inches, and is smoothly patted over with the hands. A small shoot is then cut off a Yam and inserted in the top of this pyramid about three inches. The result is, in five months afterwards, a Yam five feet or more in length, and in weight often from 20 to 25 lbs. The *Taro*, too, seems to be more extensively cultivated in the Fijis than in any of the other islands. The species most used is the aquatic, but the water of the swamps and marshes in which they cultivate it is seldom used. The dry-growing species is said to be less wholesome, and is always to be found upon the mountain sides, where in cultivated patches it helps to make an interesting picture when margined round with plantations of Banana, over which may often be seen waving to and fro the graceful fronds of a Palm or of a Tree-fern. Taro tops boiled are an excellent substitute for Spinach, and to my taste are far more delicious.

I have met with *Excœcaria Agallocha* ("Sinu gaga," or poison sinu of the Fijians) at New Caledonia and the New Hebrides, but it is more common in the Fijis. I have seldom seen it growing to more than twenty feet; it occurs close to the shore, and is seldom seen inland. The smoke of its decayed wood and green leaves is said to be a certain cure for leprosy, a disease which is very prevalent throughout Polynesia. The dense habit and compact form of this tree render it a pleasing object. *Ipomœa maritima* will occasionally be met with in patches matting down the sandy beach to the water's edge. In the island of Lathoba, which is near to the mouth of the Rewa, I met with great quantities of this plant, as also of *Acrostichum aureum* and *Clerodendron inerme*, which have spread over many acres. Two species of *Rhizophora* (Mangrove) margin the coast for miles in many parts of Fiji, and particularly near to the Rewa river.

III.

After leaving the Fijis, we visited the New Hebrides, of which group we called at Aneitum, Eromanga, Tana, and Vate or Sandwich Island. On entering the harbour of Aneitum, you see several clear green spaces upon the hills, which have the appearance of beautiful lawns, surrounded by a mass of rich foliage. On the whole, the scenery of the New Hebrides is less striking than that of the other groups we visited. The island of Vate, however, should perhaps claim some special mention. To give Aneitum and Tana their due (I cannot say much for Eromanga, as we were there only a few hours), it must be admitted that the variety of plants is something marvellous. The variegated foliage at every few paces, of the richest tints imaginable, striped and spotted with all the most glowing and brilliant colours,—*Croton*, *Dracæna*, *Acalypha*, *Eranthemum*, *Graptophyllum*, *Pandanus*, *Hibiscus*, *Anectochilus*, and I could enumerate a score of other plants, also variegated,—call upon the

real lover of plants to pause at almost every step of his ramble to admire their singular beauty. And who is there that could pass by those gorgeously attractive treasures of the vegetable kingdom—the Crotons and Dracænas—without being filled with wonder and admiration? I was so fortunate as to find upwards of thirty-five new varieties of *Dracæna* during the cruise, and was often agreeably surprised to find some in size and colour of foliage out-doing my previous idea of what might be in existence.

Aneitum may be considered perfectly safe for the traveller as regards the natives, who are certainly the most miserable-looking of any of the Polynesians I have seen. Traversing the island, I met with some fine specimens of *Dammara obtusa*. Both in Vate and in Aneitum the *Dammara* is by far the finest timber-tree, and it sometimes attains a height of about a hundred feet. Many species of *Santalum* occur in the mountains, but a large specimen of this tree is very rarely met with. Impenetrable thickets of Anacardiaceous, Acanthaceous, Malvaceous, Araliaceous, Rutaceous, Euphorbiaceous, Myrtaceous, and Fabaceous plants, seem to be the predominating Orders among the underscrub. Two climbing Ferns of extraordinary beauty,—*Lygodiction* and a *Mertensia*,—sometimes entwine themselves around and upon the stems of the larger shrubs in the jungles, and form a perfect network, often fifteen feet overhead. Several species of *Cerbera* (a very poisonous tree) are very plentiful in the New Hebrides, particularly near to the shore. The flowers are white and emit a perfume, which at night is very strong and not unlike that of a Jasmine. I was surprised in one of my rambles through the mountains to meet with two nearly full-grown specimens of *Araucaria Cookii* growing close to a village. They were no doubt introduced many years ago from New Caledonia, of which island the tree is a native. A Bamboo somewhat resembling *Bambusa Arundinacea*, though quite distinct from that species, is sometimes to be found in clumps upon the mountain sides; and very pretty it is when curving its feathery shoots over a *Sagus* or a *Livistonia*, beautiful Palms which are frequently met with inland. Advancing towards the other side of the island, I met with two species of *Areca*, Palms of exquisite beauty. Adorning the banks of a stream that meandered its way towards the sea, upon the rocks, above the water, and upon the decaying timber partly imbedded with them, Ferns of all kinds were to be seen. Two of these, more numerous than others, *Lomaria attenuata* and *L. undulata*,—their stems often three feet in length,—were suggestive of a Lilliputian grove of Tree-ferns. Close to the shore upon the other side were forests of the finest *Pandanus* I have seen. Some of them were beautifully variegated, their drooping fronds catching the spray, and their roots washed by many a billow. Night came on before I had quite reached the coast, after a toilful journey across the mountains. Sailing orders had been given for the following day, or I should have been inclined to bivouac for the night. It soon became quite dark, and the rocks, which are almost impassable along the coast, caused me many a severe tumble. To prevent this my guides lit torches of the dried stems and leaves of an *Arundinaria*, which were a great assistance. Night, however, had nearly passed over before I reached the mission station.

Tana is also very thickly covered with vegetation. While there we beheld many interesting scenes, the most important of which, and one that will never be forgotten by me, was the volcano ; and it is perhaps the most sublime sight Polynesia can present. This wonderful object is situated between five and six miles from Port Resolution, where we were anchored. The volcano is very active, an explosion taking place every five or ten minutes, that can be heard many miles away. My visit was a very hurried one, for I had been out some eight or ten miles the same day in another direction in search of plants, and, after parting with my guides, I agreed with two other natives who were alongside the ship to take me to the volcano. Accordingly, getting into their canoe, I was paddled to the shore. A narrow, and in many places rugged, path led the way through a succession of dense gloomy forests and gullies, and through several villages, in one of which, although it was getting late, I could not resist the temptation of making a sketch of a very fine species of Fig, which, from its small leaves, not more than an inch long, I have ventured to name *Ficus microphylla.* I found its girth to be about forty-five feet around the trunk. Its width, from the extremes of the opposite branches, as near as I could judge, was at least 260 feet; its height 100 feet. Several huts stood beneath its shade. Like the Banyan-tree of India, it throws down hundreds of roots to the earth, which soon grow and become props to its far-extended lateral branches. Long before I reached the volcano I had a glimpse of it from the tops of several hills. The smell of sulphur was strong three miles off, and I could notice it upon my clothes. The vegetation, therefore, becomes less dense or luxuriant. Many trees, aided by the rich soil and moisture, appear to be struggling hard to live, but scores of others are minus their leaves. A mile further, and the hills are denuded of everything. At length an undulating, sandy, parched-up plain, radiating from the mountain, opens to view. Travelling along towards the right, and within about half a mile from the crater, smoking hot springs are seen to the left ; and rather better than a mile from here, after crossing a sandy ridge, large masses of sulphur and brimstone come into view in the valley beneath. Quite close to the foot of the volcano there is a small lake, covering an area of several hundred yards. This volcano is said to be about 1300 feet above the level of the sea, but I should have thought that it was much higher. The ascent is steep and very toilsome, owing to the loose character of the pulverized lava, sand, and sulphurous matter, that gave way under foot. The only relief is an occasional piece of scoria, which gives one foot-hold as he anxiously toils upward. My guides kept up a constant chatter between themselves, and would occasionally make signs to me when an explosion took place to look out for the heavy masses of red-hot lava, often several hundredweight, driven almost out of sight, but occasionally falling near to us. When we had reached the south-eastern side of a ridge which formed one edge of what was once the crater, some two or three hundred feet from the top, my guides, in spite of all inducements, declined to go further, and appeared terrified at the idea of my doing so. At first I thought that I had come to a dangerous side of the mountain, or that the natives regarded it with a sort of religious dread. I learned afterwards from a missionary in one of the other

islands that there is a traditional story among the Tanese to the effect that a number of natives, among whom were several great chiefs, were once looking down, when the mountain, displeased with the acts of the latter, caused the side upon which they were standing to give way, and all were precipitated into the yawning gulf. The mouth is oblong, and in its great width rather more than a quarter of a mile. In this chasm, at not less than six hundred feet, can plainly be seen a huge burning mass, and apparently only a few feet below this the crater seems to be divided into two orifices, from one only of which is there eruption. Before an explosion, warning is given to the beholders by an outburst of smoke, which ascends quickly to the top. Scarcely has it reached the mouth of the crater, when a terrible rumbling, almost deafening, noise is heard, and the explosion forces into the air, several hundred feet higher than the top of the crater, tons of burning lava, in pieces varying from the size of a marble to several hundredweight. Sometimes the lava comes down vertically, but more frequently curved outwards from the mouth of the crater, and assumes various forms by reason of its soft doughy nature. I should have remained at least an hour, gazing in wonder and admiration at this most sublime spectacle, but, unfortunately, a strong south-westerly affected the regions below, and the air was at once filled with a dense sulphurous smoke which was almost unbearable. I descended to my guides, who, in the meantime, had been indulging in a pipe of tobacco. After leaving the volcano a couple of miles, again my eyes wandered over the vegetation. Strange to say, the Commodore at the time of his visit discovered a small Fern near to the mouth of the crater, which was the only scrap of vegetation, living or dead, within at least a mile and a half of it. This Fern, although not yet in seed, I believe to be a new *Nephrolepis;* but whatever generic name for it we may be able to determine, it shall bear the specific one *Lamberti*, in honour of its discoverer.

During my journey to the volcano, I found several new and interesting plants, two of which were an *Erythrina* and an *Eranthemum*. But during my toilsome ramble in the forenoon, some eight or ten miles into the interior, I found, what, without doubt, for beauty and magnificence is unequalled in the flora of Polynesia, and perhaps not surpassed for elegance and splendour in any part of the world. It was a single tree of a species of *Inocarpus*, growing to about fifteen feet, probably its full height, its leaves were long and graceful, and of so intense a golden yellow, and its stem scarcely less so, as to almost charm me as I stood beneath it in silent admiration. But, alas! there were neither seeds, seedlings, nor suckers. In vain did I look for them and for other specimens of the tree, but there were none near, and what did I not offer to my guides to take me to where they could be found? The natives indicated by signs and a few words of broken English that there were other trees of it upon the other side of the mountain, but were we to venture further the natives would kill me. I had, therefore, to content myself with cuttings, which I helped myself to pretty freely, but which, I regret to say, in spite of all my care, died a week or two after we left Tana. My guides and myself rested for half an hour beneath that most beautiful and indescribable object (with reluctance I left it), whose foliage in the bright sun cast over us a shade of golden yellow. I had heard of

the existence of this tree at least three miles away from the valley in which it was growing. The first hint was by a native pointing first to a piece of yellow calico (which I carried with other things for the purpose of payment), and then to a tree, by which I immediately understood what was meant. During our jaunt back in another direction, I found many other treasures, one in particular belonging to the Order *Musaceæ*, a genus between *Heliconia* and *Strelitzia*, bearing immense leaves beautifully striped with almost every colour.

The Tanese are, of the New Hebrideans, although not the tallest, the most muscular, and mentally the superior race. Two natives who could speak English well enough to be understood, while going with me in search of plants, expressed themselves thus :—" *Spose missi-on-a-ry come live Tana plenty Tana man come down kill it missi-on-ar-y like it pig.*" And I believe they would be savage enough to do so.

In many places in Tana, but not in any other island of the New Hebrides, a fine species of *Myristica* was plentiful. On either side of the track to the volcano, some specimens of it were growing to fifteen or sixteen feet, and beneath them the ground was covered with their fruit.

In Eromanga we remained only a couple of hours, but in Vate or Sandwich Island several days.

Having first visited Havannah harbour, and afterwards Vela harbour, I had a good opportunity of penetrating for a considerable distance into the mainland. It was late when we anchored in the first-mentioned harbour, and so no canoes came alongside till morning. A Loyalty Islander, however, who called himself "Jimmy Charcoal," came to us that night in a boat. He could speak English and several of the native dialects fluently, and, as soon as the natives came in the morning, I was enabled to speak, through him, to a chief—an old white-headed fellow, who promised faithfully to take me into the interior under his protection. Accordingly, I accompanied him in his canoe to the shore, where we were soon joined by about thirty other natives, three only of whom seemed willing to follow the chief and myself. But, much to my astonishment and discomfiture, the old chief feigned tired after we had walked about five miles inland. The other three, when they saw that I wished him to go further, signified by touching their lips and beating the ground that he was both hungry and tired, whereupon I offered him some bread, which he accepted, and ate with an appetite. He walked for a few hundred yards further, and then lurked off into a thicket. The other natives, however, seemed to be good-humoured-looking fellows, and so we proceeded on some three or four miles further, greatly encouraged by the appearance of the distant vegetation, which consisted principally of dense, more or less broken, belts of *Casuarina*, *Melaleuca*, *Barringtonia*, *Erythrina*, forests of Plantain, the fruit lying in heaps upon the ground; park-like spaces of hundreds of acres in extent; groups of Palms and Tree-ferns of great beauty, which gave to the landscape a peculiarly charming effect, such as I had not previously witnessed in other islands, but in parts of Vate I found the vegetation poor and scanty, as it formed a garden of beauty and fertility in others. On the whole, however, I should think that Vate, from its being admirably adapted for the growth of cotton, would not be a bad locality

for some enterprising company. After we had passed through several places such as I have endeavoured to describe, we came to a large village which was bordered on one side with a hedge of a gigantic *Heliconia*, growing from twelve to fifteen feet high, and which at first sight I mistook for a *Musa*. Beside this hedge I noticed upon a long pole that rested upon two forked sticks, among others, a number of human jawbones. We had not proceeded far, when a number of natives in a state of nudity, some with clubs upon their shoulders, others with bows and arrows in their hands, rushed from several huts bawling lustily at my guides, who at once stood, and a great conversation was immediately entered into between them, during which conversation I could hear the word "man-of-war" was very frequently used. I need not say how I felt as I stood in their midst, ignorant of their language, the savages scrutinizing me the while from head to foot. Several cautiously attempted to handle my revolver,—a liberty which, of course, I declined to allow. The crowd soon after began to disperse, and we passed on without further interruption for a few paces, when I thought it advisable to return, which we did by another track. I invariably made a practice of being as jovial as possible with the natives of the various islands, and I found it to be an excellent plan. To make them laugh, which is a very easy matter, and to give them a small present of calico, tobacco, etc., soon causes a sort of attachment, and they will do as much for you in return. They are, however, generally covetous, and I have found among them (particularly in the Fijis) some arch rogues.

IV.

I visited Protection and Deception Islands, which form one side of Havannah harbour. In many places the harbour is three miles wide, and, looking from the entrance, it reminds one of a beautiful river. The vegetation of both these islands presents an appearance somewhat Australian. Every tree upon them seemed to be suffering from drought. The forests of *Melaleuca* resemble, in some measure, *Eucalyptus*, and beneath them patches of *Murraya paniculata*, the fragrance of whose Orange-like blossoms fills the air with a delightful perfume, sometimes occur. The *Murraya* was the only genus of *Aurantiaceæ* I met with in those islands, while upon the mainland, the other side of the harbour, several other genera occur. The predominating Orders were *Malvaceæ*, *Asclepiadaceæ*, *Rubiaceæ*, *Acanthaceæ*, *Myrtaceæ*, *Liliaceæ*, and *Gramineæ*, of which latter, had time permitted, I could have made a large collection of dried specimens. During my rambles upon these islands I did not meet with a drop of water. As a substitute for water the natives use the milk of the cocoa-nut, which may be had in abundance. The natives here are far more filthy-looking, the women particularly, than in the other islands of Vate. In the mainland I found three species of Citron, one with very small fruit, another identical with *Citrus medica*, and the other, which was of rare occurrence, bore a fruit of extraordinary size, more than three times that of the ordinary Citron. A species of *Cookia* was plentiful, but there were neither Oranges, Limes, nor Lemons. A few hours' steam took us round to Vela

harbour, where I again had an opportunity of going ashore, and afterwards across to Pango Bay, in the neighbourhood of which I was very successful in my botanical discoveries. Mr. Kosh, a missionary, who resides there—the only one in Vate—kindly sent out with me some natives as guides, and they took me some six or seven miles inland. During my walk I found several splendid varieties of *Hibiscus*, two of which for their immense gorgeous flowers and compact habit are, I venture to say, the most beautiful of the genus ever yet discovered. The larger flowering variety is of a glowing scarlet colour, the flowers averaging seven inches in diameter, and from the manner in which the petals overlap each other, each flower is suggestive of a perfectly double Camellia. I found this inland, about five miles at the foot of a ridge, beside a group of *Casuarina equisetifolia*. The bright scarlet of its immense flowers contrasted with its vivid green foliage, and, added to its very compact habit, render it a truly noble object, justly meriting, as its popular name, the not very inappropriate one of "the Challenger Hibiscus." The scientific name must be *Hibiscus Lambertii*, in honour of the Commodore. The flowers of the other species are of a beautiful bright vermilion, the petals are double, after the style of the Anemone, and it is quite as large as a fair-sized Dahlia. This I have named *Hibiscus Wrightii*, in honour of Mr. Wright, of Hunter's Hill, Paramatta River, to whom I feel indebted for its discovery, he having visited Pango Bay, where he saw it some three or four years ago. I regretted much that my native guides would not venture further than a few miles inland from the Pango Bay side. One of them, a Rarotongan native teacher, who could speak good English, told me that to go further would be "to never return," as the natives were great cannibals, and exceedingly savage towards white men. Returning by a different track, we passed through some forests of *Calophyllum*, and through some extensive plantations of the Cassava root of Western America (*Jatropha Manihot*), and *Tacca pinnatifida*, of which the natives make arrowroot. Passing through a thicket, consisting principally of Anacardiaceous, Myrtaceous, and Araliaceous plants, we suddenly came upon a native village, in which an *Amaranthus*, prettily variegated, an *Aralia* and an *Evodia*, were growing in quantity around the houses. All are used medicinally, particularly the latter, which is remarkable for its strong perfume This plant is to be found almost in every village throughout Polynesia. It has, I think, been introduced into the other islands from the Samoas and the Fijis.

Along the coast the vegetation principally consists of several species of *Tanghinia*, *Pandanus*, *Excœcaria*, *Hernandia*, *Cocos*, *Paritium*, *Calophyllum*, and others. The under-scrub was not so dense near the coast as I had found it at Havannah harbour. It consisted of several genera of *Compositæ*, of which the more conspicuous were a *Wollastonia*, with pretty yellow flowers, and a *Cineraria*. Many varieties of *Dracæna* (of which genus I must here remark I have seen upwards of a hundred varieties during the cruise, and of which more than fifty were green-leafed), a *Grewia*, and a Jasmine, while a *Portulaca* and a *Talinum*, together with *Ipomœa maritima*, and several others carpeted the sandy beach in many places.

Port de France (Noumea), New Caledonia, was the last port we visited pre-

vious to our return to Sydney. If I had not known something of the richness of the vegetation of this place before going there, my impression on entering the harbour would have been that it was the most barren place in existence. The harbour is well sheltered, and the township large, considering the age of the settlement; but the bare-looking hills which surround it, destitute of vegetation, save a coarse grass, render Noumea anything but prepossessing or picturesque. There is, I think, a want of taste on the part of the French Government, having the facilities which they possess,—convict labour, etc., for the improvement of the appearance of the place. They would only have to send seven miles to find a collection of large and truly ornamental trees, such as it would be impossible to equal elsewhere; they could be procured in a few hours, and planted upon those barren-looking hills which are composed of really good soil. New Caledonia will yet, I think, from its fine genial climate and its suitability for the growth of almost anything, be a centre of attraction for thousands. Even now men of small means might soon gain an independence by industry. Land can be had at a cheap rate, and convict labour too. In a botanical way New Caledonia will, I have no doubt (and it is my intention to visit it soon again), produce a greater variety of plants than most islands in the Pacific. Unfortunately I spent but one day, and that a pouring wet one, in the mountains a few miles above the "Model Farm." In spite of the rain, however, I succeeded in collecting some interesting plants. A succession of very pleasing cascades occurs between two very steep mountains to the right of the farm. These steeps are literally covered with vegetation, which in every respect is far more luxuriant than any I have seen in the Samoas. The rugged pavement of stones embedded in rich volcanic or vegetable soil clothed with Mosses, Lichens, and Fungi; climbers covered with moss, like ropes hanging loosely, or binding the decaying vegetation with the living; Selaginellas, and Ferns of all kinds,—*Bletia*, *Crinum*, *Dianella*, and a variety of other plants under foot, and luxuriant beyond description, are here to be met with; and overhead, at considerable height, the massive green boughs of the taller trees, whose stems and larger branches profusely ornamented with parasites and epiphytes, together with numerous climbers, form a canopy beneath which the sun seldom or never gleams, and presents a picture of vegetable luxuriance such as language cannot describe, nor the talents of an artist do justice to. Conspicuous during my walk through more open spaces were the *Elæocarpus persicifolia*, with its large blue berries; a *Psychotria*, with rich rosy-pink blossoms; the yellow flowers of *Oxera pulchella*, and the snowy white ones of *Eranthemum tuberculatum*, and also of a species of *Murraya*, having a perfume stronger than that of Orange blossom. These, together with numerous individuals of *Geissois*, *Erythrina*, *Grewia*, *Windmannia*, *Hartighsea*, *Desmodium*, *Acacia*, *Cycrostema*, *Asclepias*, *Melodinus*, and *Eugenia*, also masses of *Heliconia* and of *Marattia*, added much to interest me during my ramble.

At the "Model Farm" many branches of industry are carried on by convicts. In one of the granaries I was shown by M. Boutan, a gentleman who manages the whole establishment, some ten or twelve tons of rice, of good quality, which

had been grown on the farm. The average yield there per acre is said to be three tons, and there are two crops in the year. A rice-field requires to be in a very moist situation; and although at the "Model Farm" they have gone to some labour in bringing the water in sufficient quantity upon the ricefields, yet I noticed (even in my one day's walk) many places suitable for its successful culture without entailing much trouble or expense. Sugar and coffee too should, I think, be worth attention in New Caledonia, especially as the best of land can be had at so cheap a rate from the Government. Convict labour also would be a matter of great moment to some. I paid a visit to the Botanical Gardens, which, considering the age of the settlement, are very creditable indeed. They are situated upon the side of a hill that overlooks the town, and command an excellent view of the harbour. Along the side, facing one of the principal streets, is a row of well-grown specimens of the beautiful "Gold Moh" of India and Madagascar—*Poinciana Regei*—which, when in flower, must indeed be a magnificent sight.

On either side of the principal walks leading up to the governor's house, which can be seen from the gate, are some Orange-trees that appeared to be very unhealthy. At nearly every corner, where walks cross each other at right angles, the *Acalypha tricolor*, with its large fiery crimson, brown and green, striped or spotted leaves, lent a brightness to other beautiful foliage with which it was backed up, and appeared more beautiful than I had seen it in the Fijis, its native place. Facing the house a row of "Dracæna ferrea rosea," planted alternately with some beautifully variegated Crotons and *Poinsettia pulcherrima* (then in flower), was also a gorgeous sight. The garden extends over some eight or ten acres, and may soon be enlarged. It, however, deserves honourable mention among the botanical gardens this side of the Equator. Among the plants that claimed my more especial notice during my hurried walk through were some native Cassias and Acacias, several small but well-grown specimens of the recently discovered Araucarias, a *Melochia*, and a *Limonia*, also indigenous. *Vanilla aromatica* seemed to be in its glory growing along a rustic bridge, near to which grew a fine specimen of *Guettarda speciosa*, which I had met with in many of the other islands. *Parettia Indica* and *Eugenia horizontalis*, two pretty shrubs, were worthy of admiration, while some plants in flower of *Poinciana pulcherrima* were charming. *Parkinsonia aculeata* and *Stachytarpheta Fischeriana*, and a small specimen of *Latania*, formed a background for some Crinums beautifully flowered. A strange-looking *Sanseviera* and a *Tradescantia* claimed a glance, and some fine specimens of *Anona muricata* and *squamosa*, *Lucuma*, *Mangifera Indica* (Mango), *Zizyphus*, and other fruit-bearing trees, formed a group of great interest. *Coffea Arabica*, with its pretty berries, caught the eye instantly along a back walk, as a background for which specimens of *Ficus prolifera*, *Acacia Farnesiana*, and *laurifolia* occurred. *Abelmoschus sabdalifera*, *Glochidion*, *Agati grandiflora alba*, *Guilandina*, *Bombax*, *Cinnamomum*, *Vitex*, and many other plants of still greater interest, no doubt, might have been seen, but time was precious, and a few hours afterwards we left Port de France for Port Jackson, which we reached in eight days: thus terminating to me a salubrious and most interest-

ing tour. Our stay in most places, as I have stated in the beginning of this very meagre account of my rambles during the 'Challenger's' four months' cruise, seldom exceeded three days, but for which limitation I should most certainly have made a larger collection of living botanical treasures. Nevertheless, as it was, I have been successful enough to bring with me in good condition, I have no hesitation in saying, the largest collection of choice and beautiful plants ever yet collected in the islands of the South Pacific.

REPORT OF THE LONDON BOTANICAL EXCHANGE CLUB.

By J. Boswell-Syme, F.L.S., Curator.

In the following Report, I have confined myself to remarks on the plants sent for distribution by the members of the Botanical Exchange Club, or those which have come under my own observation.

Thalictrum saxatile, Schleich. Little Trees Hill, Gogmagogs, Cambridge; Mr. F. A. Hanbury. In the third edition of 'English Botany' I expressed a suspicion that the flowers of this plant were not erect, and that it might be the *T. collinum* of Wallroth. I am now able to say that this is the case; the flowers are drooping. In 1863 I brought a root, gathered before it flowered under the guidance of Professor Babington, in the station mentioned above. This root I cultivated until I came to Scotland last year, so that I was able to observe its flowers for several seasons. The pedicels are thicker and less flexible than in *T. minus* and *T. Kochii*, but the flowers always droop when expanded. The Cambridge plant cultivated beside *T. Kochii*, Fries (received from Mr. H. C. Watson, who brought it from the Lake district), produced far fewer and much shorter stolons than the latter, which increased rapidly, new plants appearing on its subterranean stolons one or even two feet from the parent. The fruit of these two plants is very similar, and strikingly different from that of *T. minus*.

Ranunculus aquatilis, Linn. Several of the forms, including var. *Pseudo-fluitans*, near Warwick; Mr. H. Bromwich. In the third edition of 'English Botany' I arranged four subspecies under *R. aquatilis*. I now believe these ought to be reduced to two; the first, *R. peltatus*, with its varieties *vulgaris*, *floribundus*, and *Pseudo-fluitans*; the second, to which I propose to give the name *R. stenopetalus*, under which *R. heterophyllus*, Bab.; *R. Drouettii*, Schultz; and

R. trichophyllus, Auct. Angl. (*R. paucistamineus*, Tausch.) must be arranged as varieties. These three plants differ from *R. peltatus* in their narrower non-contiguous petals, which give a star-like appearance to the expanded flowers, and have the nectariferous pore with a nearly straight, not horseshoe-shaped border. I have seen no British specimens of the plant called *R. trichophyllus* by the Belgian botanists, which has short rigid leaf-segments, somewhat resembling in the dried state those of *R. circinatus*, Sibth. Probably *R. Baudotii*, Godr., ought to be added as a third subspecies of *R. aquatilis*, as I have observed transition states closely connecting it with *R. stenopetalus*, var. *paucistamineus*.

Ranunculus Flammula, Linn., var. *Pseudo-reptans*. Isle of Wight, Mr. F. Stratton; and Coniston Lake, Cumberland, Mr. A. G. More. The Isle of Wight plant is intermediate between the ordinary form of *R. Flammula* and the slender plant sent by Mr. A. G. More. The latter is precisely similar to examples which I possess from Braunton Burrows, Devon, collected by Mr. G. Maw, but is certainly not the same as my specimens of the Loch Leven plant. The latter locality still continues to be the only British station known to me for the subspecies *R. reptans*. I hope in the ensuing summer to procure this plant, and try if, by cultivation, it will pass into *R. Flammula*.

R. Steveni, Reich. In the list of desiderata for 1869 I have entered the name of this plant, and should be much obliged if any of our members who should meet with a form of *R. acris* with an elongate, oblique or horizontal creeping rhizome would send specimens. I believe that *R. acris* consists of two very distinct subspecies, or possibly, ver-species. 1st, *R. Steveni*, "Andr." Reich., with a horizontal or oblique elongated creeping rootstock; and, 2nd, *R. Boræanus*, Jord., with a very short perpendicular and usually premorse rootstock. Of the first of these subspecies I have no certainty that it occurs in England, though it is that represented in Sowerby's 'English Botany,' *if the rootstock was drawn from a British specimen.* About London, Edinburgh, and in the south of Fife, the only form of *R. acris* is *R. Boræanus*, Jord. The typical *R. Boræanus* I have not seen in Britain, but my *R. acris*, var. *vulgatus* is a variety of *R. Boræanus*. It is the *R. tomophyllus* of Jordan ('Diagnose d'Espèces nouvelles ou méconnues,' p. 71), not the *R. vulgatus* of Jordan; and my *R. acris*, var. *rectus* is not the *R. rectus* of Boreau, but apparently *R. tomophyllus*,

growing in a shady place. I fell into these errors from not having access to British specimens of *R. acris* with complete rootstocks at the time (November) when I was called upon to write the description for 'English Botany,' ed. 3. In the case of common plants, herbarium specimens are usually few and imperfect, and, unfortunately, I had only a month's notice before the publication of the third edition commenced on the 1st of January, 1863. The double yellow Ranunculus, cultivated in gardens under the name of "Yellow Bachelor's-buttons," is a good example of *R. Steveni.* It has usually the lower leaves less deeply divided, and with broader ultimate lobes than *R. Boræanus.*

Fumaria Boræii, Jord. Auchtertool, Fife; and Aberlady, Haddington; J. Boswell-Syme. This is the only one of the forms of *F. capreolata*, Linn., which I have seen in Scotland. It is certainly distinct from *F. pallidiflora*, Jord., which is a mere variety of his *F. speciosa*, and is a much more southern plant. I have seen British specimens of *F. pallidiflora* only from Somersetshire, communicated by Miss Gifford.

Oxalis stricta, Linn. Garden at "Tilehouse, Denham, near Uxbridge, Bucks, where it comes up spontaneously," Miss Drummond. Communicated by Mr. J. Britten.

Trifolium hybridum, Linn. Roadside between Long Niddry Station and the sea, Haddington; J. Boswell-Syme. Very abundant along the sides of the road between the footpath and the causeway. Ten years ago the plant was not there.

Epilobium anagallidifolium, Lam. High ground between Storr and Quirang, Isle of Skye; Professor M. A. Lawson and Rev. H. E. Fox. I mention this because the distribution of the true *E. alpinum* and this plant is not yet known, though there can be little doubt that *E. anagallidifolium* is much the commoner of the two.

Herniaria ciliata, Bab. Garden examples. "The root was sent to H. C. Watson from the Cambridge Botanical Garden as being certainly the *H. ciliata*, Bab. It was kept in a flower-pot some few years ago, producing very short branches and comparatively few flowers, examples of it in that state having been dried and distributed heretofore. In the spring of 1868 the root was turned into the open ground, where it throve vigorously in loose mould, and produced the more elongate branches and denser clusters of flowers, as now sent for distribution."—H. C. Watson. The specimens sent show no disposition

to approach the habit of *H. glabra* of the eastern counties, as defined in the eighth volume of the third edition of 'English Botany.'

Aster salignus, Willd.? Shores of Derwentwater; Miss Edmonds. Concerning this plant, Miss Edmonds writes, "It has been seen for many years by a local botanist, but has never been noticed at the flowering season, till this autumn. I visited the spot immediately on its being made known to me, and found the said plant in great luxuriance, established in a bed of sedges, perhaps to the extent of the eighth of an acre, and full of blossom, though passing into seed . . . It seems that the plant was known by Miss Wright and her late father, for thirty years past, but, although puzzled about it, they were content to suppose it some stray production, and the reason of their never having seen it in flower may be that the said reedy spot is very generally under water. There have been drains lately cut across it, and, the late summer favouring it, the locality has been more readily accessible. The colour of the flowers when fresh was a delicate lilac."—MARY EDMONDS.

Mr. H. C. Watson and Mr. J. G. Baker concur in considering this as *A. salignus*, Willd. Professor Babington says it is not that plant. Having now no herbarium but my own within reach, for consultation, I am unable to decide the question. I do not think it is the same as the plant which I have from the Rhine, near Strasbourg, under the names of "*A. salignus*, Willd.," and "*A. salicifolius*, Scholler," which is the common American *A. longifolius*, Lam.; but Wirtgen, in his 'Flora of the Rhine Provinces,' intimates his doubts of the Rhine plant being *A. salignus*, Willd. The Derwentwater plant has a more hispid stem, and the leaves scabrous all over the upper surface. I have not seen specimens of the so-called *A. salignus* from the banks of the Tay, or from Wicken Fen, but judging from Professor Babington's description, the Cambridgeshire plant is the same as the Rhenish one.

If I might venture to apply a name to the Derwentwater *Aster*, it would be *A. puniceus*, Linn., but my American specimens of this plant are poor, and it belongs to the most puzzling group of that very intricate genus.*

* I must confess myself unable, after examining specimens from many distant localities, to draw any clear line of distinction between the European Asters, which have been called *salignus*, on the one hand, and on the other, the American *A. simplex*, Willd., and *A. longifolius*, Lam., both very common and well-known as wild plants in the United States and often cultivated in gardens.

Senecio viscosus, Linn. Railway banks, near Frant station. Not previously recorded from Sussex, but the locality, "railway banks," indicates its being an introduced plant.

Andromeda polifolia, Linn., var. *curta*, Tate. Coombes Moss, Derby; Rev. Augustin Ley. In the 'Journal of Botany,' for 1866, p. 377, Mr. Ralph Tate called attention to a variety of *Andromeda polifolia*, with the pedicels about as long as the flowers, for which he proposed the name *A. curta*. At the time when I wrote the description of *A. polifolia* for the third edition of 'English Botany,' all the specimens I had seen had the pedicels twice or thrice as long as the flowers, and I supposed that the plate in 'English Botany,' in which they were represented, as only equalling the flowers, had been drawn from a specimen in bud,—the buds in *A. polifolia* appearing of a large size long before the flowers are open, and then having short pedicels. The Rev. A. Ley, however, has sent specimens of *A. polifolia* with the flowers fully expanded, in many of which the pedicels are only as long as the flowers, and in none more than twice as long, so that in this plant the pedicels really vary from the length of the flowers to thrice their length. In no other particular, however, do the short-pediceled plants differ from those which have long pedicels.

Gentiana Pneumonanthe, Linn. "On the heath, eastward from the paling of Woking Cemetery, Surrey; a locality not recorded in the 'Flora of Surrey,' but within very few miles from that of 'Whitmoor Common, Worplesdon,' given in the Flora."—H. C. WATSON.

Linaria vulgari-repens, E. B., ed. 3. West Cowes, Isle of Wight; Mr. F. Stratton. This form of the hybrid plant is apparently the same as that found by Mr. H. C. Watson at Shirley, Southampton, mentioned in 'English Botany,' ed. 3, vol. vi. p. 143.

A. simplex and *longifolius* quite correspond in the size of the heads, the general habit of the plant, and the shape of the leaves. The character principally relied upon to separate them is in the involucre, the scales of which are narrower, more distinctly bordered with white, and more distinctly multiserial in *simplex*. A great many of the so-called species of *Aster* have been described from garden specimens, and never matched with wild plants. *A. puniceus* is generally distinguishable from *longifolius*, with which it agrees in the involucre, by its roughly hairy stems, broader and more distinctly cordate-amplexicaul leaves and larger heads. To me, of the three American species, Miss Edmonds' plant seems nearest *longifolius*, and Wimmer's Silesian plant, which he first called *salignus* and afterwards *pulchrum*, to have just the scales of *simplex*. - J. G. BAKER.

(*A. simplex* has the leaves scarcely at all amplexicaul, and usually much narrower than those of *A. longifolius*, and I am convinced the Rhenish *A.* "*salignus*" is not *A. simplex*, but the latter from the Elbe under the name of "*A. salicifolius*."—J. BOSWELL-SYME.)

"*Mentha Nouletiana*, Timbal-Lagrave, Essai Mon. Menth. p. 11. Dr. St. Brody sends from Crantram Hill, Gloucestershire, a Mint, just intermediate between the ordinary forms of *sylvestris* and *viridis*, of which the following is a detailed description. Stem square, dark purple in exposure, erect, nearly or quite naked downwards, clothed upwards with short, soft, white, cottony, crisped hairs, which are very dense towards the top. Leaves quite sessile or the lowest with a very short petiole, the blade oblong-lanceolate, 1½–2½ inches long, 12–14 lines broad, acute or subacute, with 6–9 sharp, erecto-patent teeth on each side, the upper surface bright green, nearly naked, the lower paler, generally, especially in the upper leaves, furnished with a moderately dense coating of adpressed cottony pubescence, the veins often purple. Flowers in a dense spike, half inch thick when expanded, quite continuous, or the lowest whorl with a short space above it. The lower bracts lanceolate, slightly exceeding the whorl. Pedicels purple, half a line long, very slightly pubescent. Bracteoles conspicuously ciliated. Calyx between campanulate and tubular, three-quarters of a line long, thinly covered with short spreading shining hairs; teeth lanceolate, rather shorter than the tube. Corolla one-eighth of an inch long, glabrous or very slightly pubescent.

"This form comes under the *M. viridis*, var. *pubescens* of Grenier and Godron, and is almost precisely the plant described by Timbal-Lagrave. So far as we are aware, it has not been gathered in Britain previously."—J. G. Baker.

I have not seen this plant, so that I can add no notes to Mr. Baker's description. I hope Dr. St. Brody may be able to send specimens for the next distribution.

Calamintha menthifolia, var. *Briggsii*; 'English Botany,' ed. 3. Carisbrook Castle, Isle of Wight; Mr. F. Stratton. These specimens show the worthlessness of the character derived from the length of the peduncle compared with the length of the pedicel of the central flower of the cyme. In some the peduncle of the lowest cymes is as long as or longer than the primary pedicel, as in the Devonshire plant, but in others it is shorter. These plants all agree in being larger, more hairy, and with deeper-coloured flowers than ordinary *C. menthifolia*,—in this, agreeing with the Devonshire plant.

Galeopsis Tetrahit, Linn., var. *bifida*. Auchtertool and Pitkinnie, Fife; J. Boswell-Syme.

In the potato fields round Balmuto, this small-flowered form of *G. Tetrahit* exclusively prevails; the large-flowered form, var. *genuina*, I have seen only once in a wood not far from Balmuto House. The var. *bifida* is rarely above a foot high, varies with red or white flowers, with the lower lip notched or nearly entire, and its lateral lobes reflexed or spreading, so that the small flowers are really the only distinctive mark of the variety.

Galeopsis versicolor, Curt. Auchtertool and Pitkinnie, Fife; J. Boswell-Syme. This plant is abundant here, growing with *G. bifida*, but showing no tendency to variation. I am now convinced it is a ver-species, and that I was wrong in placing it as a subspecies of *G. Tetrahit* in the third edition of 'English Botany.'

Pulmonaria angustifolia, Linn. Near Newport, Isle of Wight; Mr. F. Stratton, who finds both the long-styled and the short-styled plants. In reference to this, I may mention that I have found the long-styled form of *P. officinalis* abundantly fertile, producing long-styled and short-styled plants, though I had in my London garden the long-styled form only.

Chenopodium rubrum, Linn. Weston Green, Surrey. Examples sent in order to illustrate the conversion of variety *Pseudo-botryoides* into almost typical *rubrum*. On Weston Green, in the parish of Thames Ditton, is a shallow pond much frequented by geese. As the water of the pond evaporates under the summer sun, a gravelly strand or shore is left bare, and is much trodden by the geese. Here, in past years, the prostrate variety of *Pseudo-botryoides* has regularly occurred in the autumn. In the hot season of 1868, evaporation was more rapid, exposing a much wider strand, and one earlier free of water. The tramp of the geese followed the retiring edge of the water; and on the less-trodden outer side of the widened strand, the plants developed into the upright, branched or unbranched, forms now sent; some of them fair typical examples of *Chenopodium rubrum*. Unfortunately, very few of the larger examples were dried, through an intention to return for more not having been soon enough carried into effect. The variety *Pseudo-botryoides* was so named because it had been mistaken by various botanists for the true *C. botryoides* of Smith. Its proper relation to typical *C. rubrum* is now placed beyond question. (See 'English Botany,' 3rd edition.)"—H. C. WATSON.

Chenopodium album, Linn. "A series of examples, numbered 1, 2,

3, 4, to illustrate the experiment recorded in the 'Journal of Botany' for October, 1868, as stated on their labels. Also, some wild specimens, to show what are intended by the names '*candicans*' and '*virens*' in the 'London Catalogue of British Plants,' 6th edition, with forms more or less intermediate between these and '*viride*.'"—H. C. WATSON. Most of the cultivated specimens sent by Mr. Watson, raised from the seeds of *C. candicans*, are intermediate forms, but some of them are true *C. paganum*; and some of the specimens of *C. candicans*, which have been cut down and have subsequently thrown out fresh branches, are true *C. viride*,—so that the supposition that these are anything more than varieties is untenable.

Polygonum aviculare vars. Mr. T. R. Archer Briggs sends from Plymouth what I believe to be var. *microspermum*; Mr. F. Stratton, var. *littorale*, from the Isle of Wight. Of the latter, I have also communicated a few specimens from Haddingtonshire. With this exception, var. *vulgatum* is the only form I have seen since I came to Scotland.

Euphorbia Esula, Linn., var. *genuina*. Railway bank, Leek Wooton, Warwick; Mr. H. Bromwich.

Euphorbia Esula, var. *Pseudo-cyparissias*. Walls of Hulme Abbey, near Alnwick; Mr. William Richardson.

Leucojum æstivum, Linn. Littlemoor, Oxford; Rev. Augustin Ley. Oxfordshire, as a published locality for this plant, rested previously on old authority; but several stations near Oxford are known by local botanists.

Asparagus officinalis, Linn. Norton Spit, Isle of Wight; Mr. F. Stratton. This is not the same as the Cornwall plant, but evidently the common Asparagus of gardens, so that, in the Isle of Wight, it can only be considered an escape from cultivation.

Polygonatum officinale, All. Kyloe Crays, Northumberland; Mr. William Richardson; and Dursley, Gloucester, Mr. J. Marsten. The specimens sent from both these stations belong to the typical form of the plant, having the peduncles 1-flowered or a few of them 2-flowered, and in the latter case forked from the very base.

Colchicum autumnale, Linn., var. *album*. Sutton Court, Pensford, near Bristol; Mr. J. F. Duthie. Mr. Duthie informs me that the white-flowered variety occurs not unfrequently together with the common form.

Alisma Plantago, var. *lanceolatum*. Kew Gardens; Mr. Baker. The wild state of var. *lanceolatum* is usually smaller than that of var. *genuinum*, but the cultivated specimens sent by Mr. Baker are of large size, showing that var. *lanceolatum* is not merely a stunted state of *A. Plantago*; and I can see no reason to alter the opinion I expressed in 'English Botany,' 3rd edition, that it does not deserve to be considered a subspecies.

Potamogeton filiformis, Nolte. Loch Gelly and Camilla Loch, Fife; J. Boswell-Syme. Although not previously recorded from Fife, this plant grows in immense abundance in both these Lochs. When fresh, the leaves are of a bright grass-green colour, by which it may be distinguished from *P. pectinatus* at some distance. The stems are shorter and the lateral branches much more nearly parallel to the main stem than in *E. pectinatus*, giving the plant much resemblance to *Ruppia maritima*. It is most abundant in shallow water, and very fine in the stream running out of Loch Gelly, where it forms a dense mat at the bottom of the water, the long peduncles floating with the current quite clear of the leaves. *P. pectinatus* also grows in Loch Gelly, but very sparingly, and in deeper water.

Wolffia arrhiza, Wimm. "From a pond in a large meadow on Apse Farm, near Sunbury Lock, between Walton-on-Thames and Moulsey Hurst, Surrey. The same plant occurs also in a splash of water, very near the church, in the parish of East Moulsey, a short half-mile from Hampton Court station."—H. C. WATSON.*

Juncus nigritellus, Don? Shore of Coniston Lake, Cumberland; Mr. A. G. More. These specimens seem to me ordinary *J. lamprocarpus*. They have 8 or 9 heads, and the perianth-leaves are all blunt. In a dried state, I am, of course, unable to say whether the leaves are terete or compressed, but, if they be the former, it will be a proof that one of the alleged distinctive characters of *J. nigritellus* is sometimes to be found on *J. lamprocarpus*. On Ben Lawers, Braemar, and in Orkney, I have collected *J. lamprocarpus* with strongly-compressed leaves and decidedly acute inner perianth-leaves, with the number of heads varying from 2 to 20.

Scirpus parvulus, Röm. et Schultes. On mud flats at the mouth of the river Avoca, Wicklow, Ireland; Mr. A. G. More and Mr. Charles

* The Rev. W. W. Spicer found it this year (1869) in a ditch at Byfleet, near Weybridge, Surrey.—H. TRIMEN.

Bailey. In the sixth edition of the 'London Catalogue,' *Scirpus parvulus* was placed in the list of excluded species, as it was believed to be extinct in the only known British locality, namely near Lymington, Hants, where it was found by the Rev. G. E. Smith about 1840; the discovery of this plant last summer, therefore, on the east coast of Ireland, by Mr. A. G. More, was a welcome surprise to British botanists, and the members of the Botanical Exchange Club will doubtless have been gratified at receiving specimens of this species which the abundant supply has enabled me to include in every parcel. To Mr. More's admirable paper on *S. parvulus* in the 'Journal of Botany' for 1868, p. 321, I have nothing to add in the way of description; but, as both he and Mr. Bailey sent me recent specimens of the plant, I am able to confirm the opinion that the plant has no leaves, the supposed leaves being evidently barren stems, each surrounded with a very short transparent basal sheath, which I could detect only in the recent plant. The Club is indebted to the Editor of the 'Journal of Botany' for the plate prefixed to this Report.

Scirpus fluitans, Linn. "A few examples taken from the bed of a shallow pool on Ditton Marsh, dried up in 1868, where they were growing amid a dense carpet of *Pilularia*. These examples are without flowers, and are sent only to show how little they resemble the true *Scirpus parvulus*, though this latter has been erroneously referred to *S. fluitans* when not floating in water."—H. C. WATSON. As there were not sufficient specimens to send to all the members of the Club, a few remarks are necessary. Mr. Watson's specimens have tufts of distichous leaves with sheathing bases, but the stems are undeveloped. The leaf-tufts are combined into compound tufts, which are connected by the branches of the bare, slender rootstock. It is evident that in *S. fluitans* the leaves are not imperfectly-developed stems, as Andersson supposes ("culmi non rite evoluti," Pl. Scand. Cyper. 8).

Carex ericetorum, Poll. Gogmagog Hills, Cambridge; Mr. F. A. Hanbury. It is strange that this plant has not been detected in any station but the above, as one of the drawings in the plate of *C. præcox* in 'English Botany' has been drawn from *C. ericetorum*. I have looked for it on Box Hill, on the Hog's Back, Surrey, and in the still more likely locality near Streatley, Berks, but without success.

Carex involuta. Hale Moss, Cheshire; Mr. Spencer Bickham, jun. A description appeared from the pen of Mr. J. G. Baker in the Report

of the Botanical Exchange Club for 1863. In this Mr. Baker agrees with Mr. G. E. Hunt in thinking that it should be considered a form of *C. ampullacea*, and not of *C. vesicaria* as Mr. Babington considers it. It differs from *C. ampullacea* in its smaller size and more slender habit, and more conspicuously in its spikes tapering towards each end and not at all squarrose, the perigynia being ascending and not spreading; they also taper gradually, and not abruptly, into the beak. From *C. vesicaria* it differs in its more slender habit, obtusely trigonous and smooth-angled stem, channelled and glaucous leaves, and female spikes with more numerous and smaller perigynia; also in its roundish-obovate, trigonous nut, which is precisely similar to that of *C. ampullacea*.

It cannot be considered as a hybrid between these two species, as the nuts are perfectly developed, and Mr. J. Sidebotham, who was kind enough to send me specimens with mature fruit, informs me that neither *C. ampullacea* nor *C. vesicaria* grow in the neighbourhood of the locality of *C. involuta;* indeed, he says, "I do not know of either within a mile or two."

Leersia oryzoides, Sw. "By the canal, near Woking Station, Surrey. It occurs sparingly by the canal side, almost opposite to the railway station; more plentifully about the first brick-bridge (not the wooden foot-bridge) beyond the station in the ascending line of the canal, where it is crossed by the road to Horsell. A new locality, not recorded in the 'Flora of Surrey.'"—H. C. WATSON.

Alopecurus fulvus, Sm. "About a pond between the church and school-house, in East Moulsey, Surrey; a locality not given in the Flora of the county."—H. C. WATSON.

Phegopteris plumosa, J. Smith. Mr. Baker sends from Kew Gardens a number of specimens from the plant thus named by J. Smith. "It is a very delicate, elegant, finely-cut form of *Athyrium Filix-fœmina*, with the sori much reduced in size and the involucre generally, but not invariably quite abortive. The original plant was found in Yorkshire, and propagated and circulated in gardens by Messrs. A. Stansfield and Son, of Todmorden."—J. G. BAKER.

Pilularia globulifera, Linn. "In a water-splash, on Ditton Marsh, where the main line of the London and South-Western Railway crosses the highway, called the 'Portsmouth Road,' profusely there in 1868, after entire evaporation of the water."—H. C. WATSON.

Equisetum Moorei, Newman. Sandhills, coast of Wexford, Ireland; Mr. A. G. More.

Mr. More sends a few barren specimens of this very remarkable plant, which is said to differ from its allies, by having herbaceous stems; though Mr. More hints that this may be owing to the exposed places in which it grows (Journ. Bot. p. 208), but has or has not this point been tested by cultivation? The teeth are wholly black, not white, as stated by Mr. Newman, and have the tips much more persistent than in *E. hyemale*, closely resembling those of *E. trachyodon*, A. Braun, but the sheaths are loose, and the stems with a comparatively large central hollow, as in *E. hyemale*.

Excluded Species and Casual Introductions.

Mr. H. Bromwich sends *Petasites albus*, Gartn., from an "old sand quarry, Guy's Cliff," Warwick. Professor M. A. Lawson, *Linaria supina*, Desf., from "ballast hills, near Hartlepool, Durham." Miss E. Jones, *Euphorbia dulcis*, L., from "Glascoed Dingle, near Llansitin, Denbighshire. Dr. St. Brody, *Rosa pomifera*, Hern., from a coppice-wood, near Painswick, Gloucester. Dr. St. Brody also sends several species from Gloucester Docks, including *Vicia villosa*, *Potentilla Norvegica*, Linn., *Caucalis daucoides*, Linn., *Ballota ruderalis*, Fries, *Bromus tectorum*, Linn., *B. velutinus*, Sm., and *B. patulus*, Reich.

Balmuto, March 31st, 1869. J. BOSWELL-SYME.

New Buckinghamshire Plants, collected by J. Britten.
New to the Sub-province of West Thames.

Rhamnus Frangula. Comarum palustre.

New to the County.

*Lepidium Draba.
Viola Reichenbachiana.
*Impatiens fulva.
*Fragaria elatior.
Orchis incarnata.
Alisma ranunculoides.
Triglochin palustre.
Juncus bufonius.
Botrychium Lunaria.
Lycopodium Selago.

New Gloucestershire Plants, collected by Dr. St. Brody in 1868.

Ranunculus Pseudo-fluitans, *Bab.*
R. Bachii, *Wirtgen.*
Aconitum Napellus, *Linn.*
Oxalis stricta, *Linn.*
Fragaria elatior, *Ehrh.*
Rosa verticillacantha. "Merat."
R. Andegavensis, *Bast.*
R. Crepiniana, *Desg.*
R. platyphylla, *Ran.*
Caucalis daucoides, *Linn.*
Polemonium cæruleum, *Linn.*
Mentha pubescens. *Willd*

Mentha hirsuta, *b.* subglabra, *Baker*.
M. sativa, *b.* paludosa, *Sol.*
Ballota ruderalis, *Fries* (the true plant).
Leonurus Cardiaca, *Linn.*
Carduus Forsteri, *Linn.*
Ruppia rostellata, *Linn.*
Chenopodium urbicum, *Linn.*

Excluded Species.

Erysimum orientale, *Br.* Waste ground, near the docks, Gloucester.
Melilotus parviflora, *Lam.* Banks of the Severn, opposite the docks, Gloucester.
Rosa pomifera, *Hern.* Coppice wood, near Painswick.
Achillea nobilis, *Linn.* Waste ground, near the docks.
Centaurea centaurioides, *Linn.* Banks of the Severn, near the docks.

NOTES ON RANGE IN DEPTH OF MARINE ALGÆ.

By Professor Dickie.

(*Read to the Botanical Society of Edinburgh; Revised by the Author.*)

The bathymetrical range of animal life has been of late attracting a due share of attention, and facts of great interest have been ascertained. Very little has been done regarding the range in depth of marine plants; few instances have been recorded, and even some of these are not quite trustworthy.

When the dredge ceases to scrape the bottom, it becomes in its progress to the surface much the same as a towing-net, capturing bodies which are being carried along by currents, and therefore great caution is necessary in reference to any marine plants found in it. Seaweeds are among the most common of all bodies carried by currents near the surface or at various depths below, and from their nature are very likely to be entangled and brought up.

The present communication is offered chiefly with the view of directing attention to the subject, and of recording a few facts, which may, perhaps, stimulate algologists to add to the number of such.

There are two effects which diminished supply of light at great depths may be expected to produce upon *Algæ*,—decrease of size and modification of colour. The proportion of light necessary for the germination of the spores, and subsequent development, surely deserves the attention of physiologists.*

* In 'Annals of Natural History,' Dec. 1868, there are some remarks by Mr. Jeffreys regarding various Mollusca, with bright-coloured shells and well-developed eyes, at depths from 200 to more than 1500 fathoms.

The influence of the law, that in water there is a limit of obliquity beyond which transmission into the air cannot occur, giving rise to total reflection, and the unequal absorption exerted on the different separable rays of light, can only be hinted at here in relation to this subject. According to Bouguer, sea-water at a depth of 700 feet loses all transparency. Mr. H. Wild, in a recent number of Poggendorff's 'Annalen,' states that light, in traversing 5 metres in depth, has its intensity reduced to one-third. He, however, adds that the transparency of water at low temperatures is greater than at higher.

Further, it is very notable that in high northern latitudes, where thick ice covers the surface of the sea during great part of the year, and where, moreover, the absence of direct sunlight for several months together produces very peculiar conditions, nevertheless seaweeds abound, the number of species not much more than fifty, but some of large size, and most of them individually plentiful.*

The late Professor E. Forbes adopted the following zones in relation to the distribution of marine organisms on the British shores :—1st. Littoral zone, comprehending the space between tide marks. 2nd. The Laminarian, from low-water mark to 15 or 20 fathoms. 3rd. The Median zone,† from 15 or 20 fathoms to 50. 4th. The Infra-median ; and 5th. The Abyssal. In the first two of these seaweeds are abundant ; they are rare in the lower part of the median zone, and very rare indeed beyond it.

In recording habitats of British *Algæ* (as in 'Phycologia' of the late Professor Harvey), the expression "cast up from deep water" is often used ; it is somewhat indefinite, nevertheless, as many delicate species are thrown on shore in very perfect condition,—they cannot have come from any great distance ; and if we examine the tidal chart in Johnston's 'Physical Atlas,' where depths round the British and Irish shores are also given, it will be seen that the line of 10 fathoms on the general coast is very narrow, but is wider in bays and arms of the sea ; and as these localities yield many species, 10 fathoms may be considered a common bathymetrical range. The following may be mentioned as reaching to or beyond 15 fathoms :—*Chorda Filum*, *Cutleria multifida*, *Zonaria parvula*, *Polysiphonia parasitica*, *Chylocladia*

* 'Journal of the Linnean Society,' vol. ix.

† He used the term median or coralline zone, the latter very loose or incorrect if applied to the *Corallinidæ* of algologists.

kaliformis, *Melobesia calcarea*, *Rhodymenia cristata*, *Phyllophora rubens*, *P. Brodiæi*, *Peyssonelia Dubyi*, and species of *Delesseria*. Several of these are also found in the littoral zone.

It is of interest, however, to ascertain the absolute limit of vegetable life on our own shores, and the only case which has come under my own notice is the following :—About ten years ago, in company with the late Mr. Hyndman, of Belfast, and Mr. Waller, when dredging near the Maiden Rocks, coast of Antrim, our dredge got fast on rocky bottom at a depth of about 80 fathoms. With some difficulty we recovered it. On examination it contained a few mollusca, abundance of living zoophytes,* and two red *Algæ*, the largest being *Phyllophora Brodiæi*, quite fresh and of the usual colour. It appeared to have been recently torn from its site; still, as it is not unfrequently cast upon the Antrim coast, it is just possible that the specimen may have been loose and accidentally entangled in the dredge. Regarding the other species, I have no doubt it was attached near the base of one of the living zoophytes; and, although not more than a quarter of an inch in length, it could be referred to *Delesseria sinuosa*, a species very widely distributed along the British and Irish shores.

In vol. ii. page 464 of the 'Antarctic Flora,' Dr. J. D. Hooker states that "8 to 10 fathoms are the utmost depth at which, judging by our experience, submerged seaweed vegetates in the South Temperate and Antarctic Ocean." This may be the general limit, but *Macrocystis pyrifera* is reported, in the same work, as attached to the bottom in 40 fathoms, though most of the very long stem—700 feet—lies near the surface. Lamouroux speaks of the *Algæ* growing at 100 or 200 fathoms, but the statement is more than doubtful. Humboldt records *Fucus vitifolius* (*Caulerpa vitifolia*, Lamx.; *Chauvinia vitifolia*, Kützing), as growing in 30 fathoms, and quite green. In 'Nereis Americana,' *Anadyomene stellata* is stated to grow in 20 fathoms, and of the usual green colour, in the Gulf of Mexico. In his report on the Ægean Sea, the late Professor E. Forbes states that *Constantinea reniformis*, P. and R., occurs at 50 fathoms, and he considered this as the greatest depth, accurately observed, at which *Algæ* vegetate. In a recent number of

* It may be interesting to state the species :—*Sertularia abietina*, *S. rugosa*, *S. argentea*, *S. rosacea*, *Tubularia indivisa*, *T. Larynx*, *Tubulipora serpens*, *Halecium Beanii*, *Flustra avicularis*, *Crisia eburnea*, *Laomedea* —— ?, and *Caryophyllia Smithii*. The latter lived in an aquarium for nearly two years after.

'Silliman's Journal,' Count Pourtales states that *Centroceras clavulatum* came up in a dredge which had been at the bottom in 270 fathoms; this species is stated in 'Nereis Americana' as abundant at Key West, everywhere near low-water mark. I doubt very much whether this plant was brought from the bottom; most likely it was caught by the dredge in its progress towards the surface. In Areschoug's 'Phyceæ Scandinavicæ Marinæ,' it is stated that *Desmarestia aculeata* has been got, between Jutland and Norway, at a depth of 90 fathoms.

In the supplement to Captain Inglefield's 'Summer Search for Sir John Franklin' (1853), there are some cases which were recorded by myself in the Botanical Supplement to the work. They were given on the authority of Dr. P. Sutherland, from whom I received the specimens, viz.:—

	Fathoms.
Fucus vesiculosus	40 to 50
Desmarestia aculeata . . .	80 ,, 100
Dictyosiphon fœniculaceus .	50 ,, 100
Agarum Turneri	10 ,, 100
Laminaria longicruris . . .	50 ,, 100
Chordaria flagelliformis . .	80 ,, 100
Chætopteris plumosa . . .	25 ,, 30
Ectocarpus Landsburgii (?) .	70 ,, 80
Euthora cristata	98 ,, 100
Ptilota serrata	30 ,, 40
Kalymenia Pennyi	20 ,, —
Conferva Melagonium . .	20 ,, —

Respecting the greater depths in the above list, I have much doubt. It is a well-established fact that masses of *Algæ* are set adrift by the action of the ice in summer, and are seen floating in great masses. Under such circumstances, though the dredge may have been at the bottom in 100 fathoms, it is rash to conclude that all its contents, especially *Algæ*, have been growing at that depth.

During the voyage of the 'Fox,' under the command of Sir L. M'Clintock, Dr. Walker dredged *Rhodymenia interrupta* at the east end of Bellot Strait, in about 60 fathoms as estimated; the plant is now known to be an Arctic form of *Phyllophora Brodiæi*, and this is of some interest in relation to the probable existence of the plant at 80 fathoms on the Irish coast, already alluded to. Captain Thomas Mitchell, late commander of the 'Queen of Nations,' belonging to Aberdeen, gave me some material which came up adhering to the sounding-

lead from the Abrolhos shoal, in 40 fathoms, in lat. 18° 11″ S., long. 32° 43′ 15″ W., thirty miles from the nearest part of the coast of Brazil. Most of it consisted of a species of *Melobesia*, much decayed, but partly also fresh and entire; adhering to it, growing on it, in fact, there is a solitary specimen of an *Alga* of bright crimson. On examination I had no hesitation in referring it to the genus *Peyssonelia*. It is not very prudent to describe supposed new species from solitary examples; nevertheless, as it seems to differ from others known to me, and being of interest in relation to the subject, it may be legitimate to record it under the provisional name *Peyssonelia abyssicola*, sp. n.* If a single cast of the sounding-lead did such good service, how much more would the dredge accomplish on this Abrolhos shoal?

Finally, it is worthy of notice, that species which reach the lowest depth where *Algæ* vegetate are chiefly Rhodosperms; next in order the olive-coloured. The Chlorosperms prevail in the littoral and upper part of the laminarian zones.

Diatomaceæ are usually considered to rank among the lower forms of *Algæ*. I may close with a brief reference to their range. Although some few species have been certainly brought up from the greatest depths reached by the dredge, it does not necessarily follow that they live and propagate there. Many of the marine species adhere to the higher forms of seaweeds, and necessarily have a limited range; while not a few of the free species occur at or not far below the surface. Along with the *Delesseria* already mentioned as growing at 80 fathoms, I only detected three Diatoms, viz. *Melosira marina*, *Coscinodiscus radiatus*, and *C. eccentricus*. These minute organisms are so indestructible, so abundant, and widely diffused, that it is not surprising to find them in matter dredged at various depths. The *Melobesia* from the Abrolhos shoal yielded at least a dozen species, but I cannot positively assert that they were living.

It is to be hoped that in future more attention will be paid to this subject. Exact records of depth will add to the interest pertaining to the *Algæ* procured, besides contributing to a department of inquiry very much overlooked; in this respect zoologists are far ahead of algologists.

* *Peyssonelia abyssicola*. Nearly circular, faintly zoned concentrically, subtomentose beneath, about half an inch in diameter; colour bright red; upon *Lithothamnium mamillare* (*Melobesia mamillaris*, Harvey).

Tab. 9.

W. G. Smith, ad nat. lith.

Vincent Brooks Day & Son, Imp.

ON THE GENUS *KNORRIA, Sternb.*

By W. Carruthers, F.L.S., F.G.S.

(Plate XCIII.)

This genus was established by Sternberg, in the 'Tentamen Floræ Primordialis' (p. xxxvii.), which accompanied the first volume of his 'Flora der Vorwelt,' for two stems which he considered to be dicotyledonous, and to have been clothed with fleshy cylindrical leaves, like some succulent plants. The fossils were casts found in beds belonging to the Coal-measures. Stems that are imbedded in sandstone have frequently entirely perished, and the cavity remaining having been afterwards filled in with amorphous material, there is no indication of the fossil except this cast of the original, which shows often in the most perfect manner all the external characters of the stem, but without any trace of its internal structure. As a consequence, considerable uncertainty has always existed as to the true nature of these fossils. They are described as decorticated stems, without any definite meaning being attached to the term 'decorticated.'

Professor Williamson has clearly established that some Sternbergias are the casts of the medullary axis of *Dadoxylon*. *Endogenites striata* of Lindley and Hutton is a similar cast of that or an allied coniferous genus. The most familiar condition of *Calamites*, as a fluted and constricted stem, is in like manner only the cast of the medullary or cellular axis; the thin incrustation of coal which is attached to it when it is removed from the rocky matrix, representing the greatly altered woody tissue. *Knorria* also is the cast of the interior of a Lepidodendroid stem, as was at first supposed by Sternberg, though he afterwards changed his opinion, and by many subsequent writers as Gœppert, Dawson, etc. It has been described by these authors as "decorticated." In the stems mentioned, with the exception of *Knorria*, the "cortex" means the whole of the woody tissue, as well as the cortex properly so-called. In *Lepidodendron*, however, the wood is a very slender cylinder in the centre of the stem, while the casts of *Knorria* have a considerable diameter. A specimen from the Coal-measures, near Edinburgh, for which I am indebted to Charles Peach, Esq., whose long-educated eye appreciated its value, exhibits the relation of the cast to the complete stem. In the lower part of the specimen, the short

truncate processes, supposed to be fleshy leaves, are present, but in the upper portion these are exhibited as long, slender processes, from two to three inches long. They are composed of the same amorphous sand which forms the stem itself, and are consequently casts proceeding from, and filled up through the stem. These processes are all free from the stem, being separated from it by a thin film of coal, and in consequence of this, the processes are broken off from the lower portion of the specimen. The whole stem is covered with a thin layer of coal, which separates it from the incrusting rock.

In examining the structure of the stem of *Lepidodendron* we find, as already stated, that the woody cylinder is too slender to have formed the mould in which *Knorria* was cast. The wood was surrounded by a cellular tissue of considerable thickness, and so delicate that it has never yet been seen preserved in anything like its entirety. It is generally replaced by some amorphous or crystalline substance, and its nature has been detected only by the occasional preservation of small portions, which have been protected by their neighbourhood to the woody cylinder, or to the outer sub-cortical layer. This outer layer is composed of small, regularly arranged, elongated cells. It appears to have been more durable than any of the other tissues, having resisted the decay which speedily destroyed the medulla, and the delicate cellular structure between it and the wood, and even the woody cylinder which, from its relation to these two cellular structures, was probably more liable to decay. The specimens of erect *Sigillariæ*, discovered by Mr. Wünsch, in Arran, preserved erect in beds of volcanic ash, are completely hollowed out; all the interior cellular and vascular tissue has disappeared, and only the layer of elongated cells and the outer cortical layer of indurated cells remain. This compact cylinder of elongated cells in *Lepidodendron* is penetrated in a spiral manner by the vascular bundles which pass to the leaves. These bundles are composed of a few scalariform vessels, surrounded by a considerable quantity of cellular tissue, of the same delicate structure as the inner layer which is always altogether, or almost altogether absent, and, like it also, it is very rarely preserved.

This specimen then shows that *Knorria* is a Lepidodendroid stem which, after being imbedded in mud or sand, lost by decay the whole of its interior up to the cylinder of elongated cells, and lost besides this, the vascular bundles with the accompanying cellular tissue which

passed upwards and outwards through the remaining structure to the leaves. Into this large central mould and the small radiating tubes the amorphous material was pressed, until it completely filled them. Subsequently the cylinder of elongated cells was converted into coal, forming a thin film, which surrounds and separates every cast of the cavity of the vascular bundle. The pressure to which the stem was subjected has compressed it, and also pressed the long processes against it.

The upper portion of the specimen figured would be referred to *Knorria longifolia*, while the lower portions represent the appearance of the stems named *K. imbricata*. Professor Schimper has given an extensive series of illustrations of these stems in his 'Le Terrain de Transition des Vosges,' plates xiii. to xx. He considers the subcortical 'cushions' of the leaves to have been produced between the wood and the bark, but if the fossil belongs to *Lepidodendreæ*, where he, as I believe, correctly places it, this is an uncertain locality. For if we consider the cellular structure external to the wood cylinder as cortex, then it is certain that there is a very much greater diameter in the stems of *Knorria* than is known to exist in any *Lepidodendron*. And if on the other hand the cortex refers to the external layer of thickened and indurated cells, this was too thin a layer to permit the formation of such long processes. The interpretation supplied by the specimen figured explains the peculiarities of the fossil, and also shows that it can no more be retained as a separate genus than *Sternbergia*.

Explanation of Plate XCIII.

Specimen of *Knorria*, from the Edinburgh Coal-measures, from the cabinet of Charles Peach, Esq., Edinburgh.

REPORT ON THE CULTIVATION OF CHINCHONA IN BENGAL FOR THE YEAR 1867–68.

By Thomas Anderson, M.D.,

Superintendent, Botanical Gardens, and in charge of Chinchona Cultivation in Bengal.

[Read before the Botanical Society of Edinburgh.]

The cultivation of the Chinchonas has been most successfully carried on during the year. The open-air cultivation has been greatly extended, and now consists of four times the amount of plants reported

last year. I shall follow the arrangement of the report of last year, and shall consider the plants in their different stages of growth.

Stock Plants.—These plants, which are all grown under glass panes, are in excellent condition, and, notwithstanding the vast amount of cuttings they have yielded, their vigour has increased during the year.

Seedlings.—A quantity of excellent seedlings of *C. officinalis,* and a very few of *C. succirubra*, were reared from seed yielded by the plants planted at Rungbee in October, 1864. Besides these, I received during the year several packets of seed of *C. officinalis* and of *C. succirubra* from Mr. Thwaites, the director of the Botanical Gardens, Ceylon. The number of seedlings raised during the year amounted to 101,750. The number of seedlings obtained during the previous year was 38,500.

Nursery Beds.—Large additions were made to the nursery beds. Most of the plants in these beds remained unprotected throughout the winter.

Permanent Plantations.—The formation of the open-air plantations, and the tending of the plants in them, are the simplest parts of the cultivation of Chinchona as practised at Darjeeling. As the process of planting followed by me at Darjeeling has not yet been fully stated in any of my previous reports, the time has now arrived for narrating the various stages of the open-air cultivation, from the clearance of the forest-covered land until the end of the second year of the growth of the plants. Hitherto, the land selected has consisted of ground on which Lepchas had previously carried on the cultivation of Maize, Millets, and Rice (a peculiar variety, which is grown without being irrigated) in the manner known as joom* cultivation, with patches of virgin forest occurring every here and there among the partially-cleared spaces.

Nepalese coolies with their kookeries (short, heavy, curved knives), and Lepchas, with their long, straight, sword-like knives, are sent to fell the jungle as close to the ground as possible.

* Joom cultivation is the term used to designate the rude cultivation practised by most of the hill tribes of India. It consists of felling and burning virgin forest (leaving the stumps of the trees standing) for the growth of subtropical grains. After two or three crops have been obtained, the ground is abandoned for a freshly-cleared patch of forest. The piece abandoned soon becomes covered with a dense vegetation of shrubs, gigantic grasses, and young trees.

The scrub, and even young trees as thick as a man's body, fall rapidly before the knives of these clearers. Where patches of virgin forest are met with the axe must be used; but here every tree is not felled, as the smaller ones, being notched near the ground, are borne down by the fall of the full-grown trees. In preparing ground for Chinchona planting at Darjeeling, the practice has always been to clear the land entirely of all vegetation,—not a tree of even the smallest size ever being spared. In these hills, forest should not be felled before the middle or the end of November; if the land is cleared earlier, the grasses and underwood spring up among the branches of the fallen trees, and thus their burning is prevented. Felling may be continued until the middle of March. After two or three months' exposure to the bright sunshine and dry air of the cold season, the felled trees are in a fit state to burn. By the end of March, therefore, fires may be lit in the afternoon, when the sun has thoroughly dried up the heavy dew, at the bottom of the slope covered with felled and dry jungle. The fire rapidly consumes the whole of the brushwood and the branches of the trees, leaving only the large branches and trunks to smoulder for weeks.

Wherever virgin forest or bamboo jungle has existed it has been necessary, after burning the lighter vegetation, to cut up the trunks of the trees and the bamboos into short pieces, and either to pile them into heaps for burning, or to roll them into the steep ravines which are too stony for planting Chinchonas. The land thus cleared by fire is ready for laying out the ground for planting, and for marking out the bridle paths required to give easy access to all parts of it. These paths are made about four or five feet wide, and are connected with the principal roads of the plantation. The sites for the plants are fixed by means of a cord about 100 feet in length, on which marks are tied at intervals of six feet for *C. succirubra*, and at shorter distance for *C. officinalis*. This marked cord is stretched along the ground, and at each mark on it a stick, about two feet and a half in length, is thrust into the ground, thus indicating the place where a Chinchona is to be planted. In order to secure uniformity in the plantation, each line is continued to the full extent of the ground to be planted before another line is commenced: the lines in properly laid-out plantations will thus be parallel.

In the plantations of *C. succirubra* the lines are fixed at six feet

from each other; and as the plants are six feet apart in the lines, a form distance of six feet between the plants is maintained.

At first *C. officinalis* was planted with an interval of five feet between the plants, but I have lately altered this plan for a system of close planting in lines, the lines being four feet apart.

After the ground has been "staked out," the next preparation for planting consists of digging the soil to the depth of a foot, removing the roots at the same time in a circle about one foot in diameter, of which the stake is the centre. The planting of the ground thus prepared is performed in dull, cloudy weather, when showers are frequent, but when the ground is not saturated by long-continued heavy rain. The thoroughly hardened plants are brought from the adjoining nursery-beds in shallow boxes, which the men carry on their heads. The plants are given to the coolie engaged in planting, who, with his hands, makes a hole in the loose soil sufficiently large to admit the roots of the plant, and the soil is gently pressed around the roots to prevent the plant being beaten down by a heavy rain. The plants when taken from the nursery-bed should not be less than four inches and should not exceed a foot in height, but plants varying from six to ten inches in height are of the best size.

After the plants have been planted for three weeks it is necessary to cut down the weeds which had sprung up around them, as in a few weeks more the young Chinchonas would soon be smothered in a jungle five or six feet high. These weeds require to be cut down once a month from May until the end of October; they are laid in lines following the slope of the hill, and the slightly raised ridges soon disappear as they are decomposed by the heavy rain and high temperature. During the same period of the year it is necessary to weed every six weeks the prepared circles in which the Chinchonas are growing, and at the same time to loosen the soil round the plants by lightly hoeing with a kodalie or furroah. In November the entire surface of the plantations is thoroughly hoed, and by this means the weeds receive a great check by being exposed to the drying sunshine of the cold season after having been uprooted. After hoeing, the plantation requires no attention until the end of April, when a light covering of weeds having sprung up again, the circles round the plants should be lightly hoed and somewhat enlarged. From May again until the end of October the periodical cutting of the weeds must be continued,

but not so frequently as in the previous season, as many of the strongest-growing weeds by this time have succumbed to the hoeing in November. The growth of the plants is greatly favoured by a hoeing of the ground in November again, after the second growing-season is over; and if this is done in the following year, their third growing-season, the plants are tall and strong enough to outgrow the jungle, which then begins in its turn to be smothered under the dense foliage, at least, of *C. succirubra.*

The Selim Tea Association purchased 10,000 plants of *C. succirubra* in July, 1867, and all of these, which were planted on steep slopes of the Himalaya immediately above the Terai, are inferior in condition and promise to only the splendid plants of Chinchona in the Government plantation at Rishap, close to Rungbee.

Chemical Analysis of the Bark.—The bark of *C. succirubra* and *C. officinalis,* referred to in the last annual report as having been sent to London for analysis, was analysed by Mr. Howard. The analysis was most satisfactory, one specimen of *C. succirubra,* thirty-one months old, yielding no less than 7·30 per cent. of precipitated alkaloids, of which 3·20 was quinine and 2·27 cinchonidine mixed with a little quinine,—a larger percentage of alkaloids than has been found in any other bark of the same age. The bark of *C. officinalis,* taken from plants twenty-eight months old, gave 3·20 of alkaloids. The conclusion drawn by Mr. Howard from this analysis is, "that there is no reason to think the Darjeeling barks at all inferior to those grown at Ootacamund; the difference of climate does not appear to have much effect on the alkaloids therein contained."

Flowering and Seeding.—A small number (270) of plants of the varieties of *C. officinalis,* planted in October, 1864, have again produced a profusion of flowers, and already many of them are covered with most promising panicles of seed-vessels. A considerable amount of good seed was obtained from several of these plants in August and September, 1867. Out of 389 plants of *C. succirubra,* planted in October, 1864, only two plants produced flowers and seed last year, and a few seedlings were raised from their seed. These plants, which were in an unhealthy state at the time of flowering, soon after became healthy and vigorous, and this year they have not flowered. Another plant of *C. succirubra,* from whose stem a large piece of bark was taken, has put forth a few flowers from one or two of the branches.

With these exceptions, none of the *C. succirubra* plants have flowered at Darjeeling, although many of the oldest plants are above twelve feet in height.

Distribution of Chinchonas.—11,390 plants of *C. succirubra* were distributed during the year. Of these 10,290 were sold to planters in the district of Darjeeling, 1000 plants were despatched to Chittagong for distribution among the tea-planters, and 100 were sent to the deputy-commissioner of Hazara in the Punjaub.

Private Cultivation of Chinchona in Darjeeling.—100 acres were planted with *C. succirubra* during the year by the Darjeeling Chinchona Association, the area being 120 acres. At Coombe Banks, the Chinchona estate of Major Fitzgerald, twenty-five acres have been planted.

The Darjeeling Tea Company possesses some fine plants of *C. succirubra*, planted in May, 1864. This company is also forming plantations of red bark on land well adapted to the cultivation of Chinchona.

Mr. Robson, the superintendent of the Chinchona plantations of the Tuckvar Tea Company, has made large additions to the plantations of *C. officinalis* and *C. succirubra*. Some of the older plants of *C. officinalis* on this estate are now in flower.

The Selim Tea Association possesses 10,000 plants of *C. succirubra*, which were purchased from the Government plantations in July, 1867.

1000 plants of *C. succirubra* were sent to Chittagong in February, 1868, and most of them arrived in good order.

Khasia Hills.—The establishment of a small nursery at the Khasia Hills was sanctioned by Government early in 1867. The nursery was intended only for raising plants of Chinchona for distribution among the planters in Assam. One of the European gardeners from the Darjeeling plantation was sent, in February, 1867, in charge of the plants from Darjeeling, with which the cultivation was to be commenced. He reached Shillong in the Khasia Hills in the end of March, and early in May the cultivation was commenced near the Dak Bungalow of Nunklow.

The plants had been increased from 650, the original number sent from Darjeeling, to 6778 on the 31st March, 1868. The distribution was begun in March, 1868, by the sale of 100 plants, and other applications had been registered. The species in these nurseries is *C. succirubra*, the only species that will probably succeed in Assam.

ON *HABENARIA MIERSIANA*, *Champ.*

By H. F. Hance, Ph.D., etc.

This Orchid, one of the rarest members of the Hongkong flora, was first described by its discoverer, the late Lieut.-Colonel Champion, in 1855,* the determination being supervised by Professor Lindley, who pointed out a close affinity with the Nepalese *H. geniculata*, Don. Mr. Bentham admitted the species in his 'Flora Hongkongensis,' with some slight modification of the character, but without any special remark. Thunberg, in 1784,† described an Orchid from the neighbourhood of Nagasaki, which he erroneously took for *O. Susannæ*, L. Ten years later, however, having in the interval discovered his mistake, he gave a figure of the plant,‡ under the name of *O. radiata*, adducing his former name as a synonym. Lindley, in his monograph of the family, placed this in the genus *Platanthera*,§ no doubt on account of its supposed relationship to *P. Susannæ*, for he had seen no specimen, and his diagnosis was simply framed from Thunberg's description. As regards that author's figure, the flower is a very good representation of that of *Habenaria Miersiana*, but there are only two in the raceme, and the leaves are depicted much narrower and more acute than in the Chinese plant.

Amongst Maximowicz's Nagasaki plants is an Orchid distributed by him under Lindley's name, which I find on a careful comparison and dissection of the flower, to be in all respects identical with Champion's species, the fleshy processes of the stigma, characteristic of typical *Habenariæ*, but not occurring in *Platantheræ*, being equally conspicuous. It was not until after I had ascertained this fact, that I became aware that the same plant had been previously gathered in Japan by Buerger and Siebold, the latter of whom also considered it as the one described by Thunberg; whilst Professor Miquel, on account of its having broader leaves and less deeply-cut lateral labellum-lobes than represented in the plate, characterized it as a new species, under the name of *H. Sieboldiana*,‖ very acutely remarking: "Præsertim confinis videtur *H. Miersianæ*, Champ., cujus autem lobi labelli laciniati." This, which is certainly an imaginary, is doubtless also a

* Hook. Journ. Bot. vii. 37.

† Flor. Jap. 25.

‡ Ic. Plant. Jap. Dec. 1, t. 2.

§ Gen. et Spec. Orchid. 296.

‖ Ann. Mus. Lugd.-Bat. ii. 208.

conjectural point of difference, for he can scarcely have seen the plant of Champion, who only twice met with it, whilst I have myself, I believe, never possessed but three specimens, two of which are in my herbarium, the other sent to Professor H. G. Reichenbach. Having subsequently received a specimen from Maximowicz, Miquel remarks :* "*H. Sieboldiana*, quam prope Nagasaki legerunt Maximowicz et Mohnike, ab illo *H. radiata*, Lindl., statuitur, qui itaque synonymon Thunbergianum huc duxit : donec exemplar authenticum investigatum sit, hac de re dubia supersunt." These doubts can perhaps only be authoritatively solved by the botanists of Upsala ; but that there is no good reason for calling in question the identity of Champion's and Miquel's species with that of Thunberg is, I think, evident, from the fact that the former has apparently been gathered by every botanist who has collected around Nagasaki, where M. Maximowicz resided an entire year, and enjoyed every facility for exploration ; that it is the only plant yet found there agreeing at all with Thunberg's description and plate ; and that, looking to the great difficulties and impediments that a traveller had to encounter, as graphically detailed in his preface, some allowance may fairly be made for a drawing executed from a dried, and very likely depauperate and indifferent specimen.

In describing a new Cantonese Orchid in the last volume of this Journal, I referred it to *Peristylus*, explaining that I did so, not from any conviction of the validity of that genus, but because I felt uncertain as to the limits of any larger group in which to locate it. I may take this opportunity of saying that, on more mature reflection, I quite concur with the reduction of *Cœloglossum*, *Peristylus*, *Platanthera*, and *Gymnadenia* to *Habenaria*, as proposed by Mr. Bentham and since acquiesced in by Professor Asa Gray,† two of the most accomplished of living botanists. Nor, indeed, though at present inclined to keep it so, am I satisfied that the absence of a *bursicula* suffices to maintain the genus apart from *Orchis*, with which it is combined by Grenier and Wilkomm. For, while the existence of fleshy stigmatic cornua could scarcely of itself be defended as a sufficient ground for the generic severance of *Habenaria* from *Platanthera*, it must, at least in any philosophical classification, if depended on, be recognized as of equal and unvarying value in very closely allied groups. But Professor

* *Op. cit.* iii. 194.
† Man. Bot. N. Un. St., 5th ed. 499.

Lindley himself speaks doubtfully of its constancy in *Cœloglossum*,* and admits its occasional absence in *Gymnadenia*.† With regard to the length and shape of the spur, all gradations occur, quite unconnected with the presence or deficiency of the stigmatic processes; and although the existence of this appendage may be fairly regarded as a somewhat important character, its modifications in form and size seem of no more value than those of the labellum, sepals, or petals. Nor can it well be maintained that the obliquity of the anther-cells is of any special structural importance, even were not the differences in this regard between two such closely allied species as *H. bifolia* and *H. chlorantha* a convincing argument. The plant described by me should therefore bear the name of *Habenaria Sampsoni*.

SERTULUM CHINENSE QUARTUM: A FOURTH DECADE OF NEW CHINESE PLANTS.

By H. F. Hance, Ph.D., etc.

1. *Indigofera (Euindigofera) melilotoides*, n. sp.; caulibus erectis angulatis elevato-striatis glabriusculis, foliis pinnatim trifoliolatis foliolis cuneato-linearibus obtusissimis emarginatis brevissime petiolulatis adpresse puberulis, stipulis inconspicuis, racemis angustis virgatis folia multoties superantibus multifloris, calycis puberuli dentibus lineari-setaceis, petalis cærulescenti-albis carina apice maculata, leguminibus ovoideis compressissimis 1- rarius 2-spermis glabris.—In rupestribus collium aridorum prope Peking, m. Augusto 1865, coll. Dr. S. W. Williams; circa Jehol invenit R. P. Arm. David. (Exsicc. n. 12469.)

A remarkable species, with exactly the habit of a Melilot, having seemingly no direct affinity with any other species known to me. The inflorescence is somewhat like that of *I. australis*, Willd., or *I. Bungeana*, Walp.,—also received from Dr. Williams,—which however is described as having a linear few-seeded pod. Dr. Williams has sent me either a very closely allied species, or a variety of the present, with the leaflets thicker in texture, and pinnately bijugous; but the specimen is not sufficiently perfect to warrant a decided opinion.

* Gen. et Spec. Orchid. 302. † *Op. cit.* 275.

2. *Smithia (Eusmithia) salsuginea*, n. sp.; caule ramoso hinc inde parce setuloso, foliolis 1–2-jugis cum impari cuneato-obovatis obtusissimis margine costaque subtus distanter setulosis, stipulis parte basali decurrente superiore duplo breviore ovato-lanceolatis nervosis scariosis margine hyalino-albidis, racemis simplicibus v. ramosis folia pluries superantibus 2–5-floris, pedunculis parce setulosis, bracteis ovato-lanceolatis calyce 4-plo brevioribus adpressis, calycis 4-linealis scariosi glaberrimi inferne elevato-striati superne reticulati nervulis excurrentibus pectinati segmentis subæqualibus inferiore lato ovato rigide apiculato superiore orbiculato late emarginato, petalis flavis, leguminibus articulis circ. 9 plus minus (nunc obsolete) tuberculatis.—In palude salsula pæninsulæ Kaú-lúng, juxta mare, ex adverso ins. Hongkong, sociis *Smithia conferta*, Sm., et *Geissaspide cristata*, W. et A., mense Octobri 1868, detexit oculatissimus Sampson. (Exsicc. n. 15113.)

This plant with its companions are all additions to the Hongkong Flora, due to the vigilance of Mr. Sampson, who has likewise found *Smithia sensitiva* at Canton. *S. gracilis*, Benth., and *S. humilis*, Benth. (neither described, to my knowledge), appear to be its nearest allies.

3. *Vernonia (Ascaricida) clivorum*, n. sp.; herbacea, sesqui-tripedalis, caule angulato elevato-striato tomentoso, foliis brevipetiolatis oblongis v. oblongo-lanceolatis acuminatis distanter calloso-serratis supra costa tomentella excepta glabriusculis subtus pilosulis atque guttulis resinosis pallidis conspersis utrinque sed præcipue subtus prominulo-reticulatis, floribus laxe paniculatis, capitulis hemisphæricis longiuscule pedunculatis 20–30-floris, involucri squamis linearibus acutis arachnoideis et glandulosis interioribus anguste hyalino-marginatis exterioribus sensim brevioribus, flosculis purpureis, achæniis angulatis striatis fuscis glandulosis albo-strigosis basi pallide bulbosis, pappi albidi setis omnibus capillaribus exterioribus brevibus, receptaculo fimbriato-alveolato.—In frutectis clivorum ad fauces Shiu-hing fluv. West River, prov. Cantoniensis, mensibus Februario Octobrique a. 1867, collegit Th. Sampson. (Exsicc. n. 14743.)

The nearest ally of this species is *V. nemoralis*, Thw., which however has rather larger capitula, rounded involucre-scales, achænia twice as long with the outer pappus-scales subpaleaceous, and narrower much less prominently reticulate leaves.

4. *Fraxinus (Fraxinaster) rhynchophylla*, n. sp.; ramis obtuse quadrangulis, ramulis apice ad insertionem foliorum inflorescentiæque dense

fulvo-hirsutis, foliis 2–3-jugis, foliolis subæqualibus $1\frac{1}{2}$–2 poll. longis petiolulo subsemipollicari anguste marginato suffultis e basi plerumque lata truncata ovatis deltoideo- vel rhombeo-ovatis subito in acumen longum productis crenato-serratis costulato-nervosis non reticulatis costulis utrinque 5–7 complanatis vix elevatis subtus secus costam ad insertionem costularum 2–3 infimarum fulvescenti-lanosis præterea glaberrimis, floribus dioicis, masculis in paniculas confertas erectas foliolorum par infimum raro attingentes digestis, pedicellis lineam longis, calyce $\frac{1}{3}$ lin. longo acute 4-lobo, corolla nulla, antheris lineam longis obtusis filamentis paulo longioribus, flor. fœm. et samaris . . . . . ?—In umbrosis montanis Chinæ borealis, prope Jehol, Maio florentem, coll. R. P. Armandus David, missionarius apostolicus. (Exsicc. n. 14679.)

So far as I am aware, but two Ashes of the section *Fraxinaster* have hitherto been recorded from Eastern China:—*F. Chinensis*, Roxb., only known to me from Roxburgh's character, and from the figure given by Mr. Hanbury in his 'Notes on Chinese Materia Medica,' and *F. Mandshurica*, Rupr. The former differs by its lanceolate merely acute leaflets, of which the terminal one is described as much larger than the others, and borne on a long petiolule, its small drooping panicles, and polygamous flowers: of the latter, which Regel (Tent. Fl. Ussur. 104) is disposed to think may be a mere variety of *F. excelsior*, I have an authentic fruiting specimen, gathered by Maximowicz at Possiet Bay; it differs widely by its much larger oblong gradually acuminate leaflets, finely reticulate and slightly downy beneath along the whole midrib, cuneate and sessile, and hairy at their insertion; the flowers also are destitute of calyx. Like its Manchurian congener, M. David's plant, by its diœcious flowers, shows an affinity with the American species. The primary costiform veins are flattened, as if subjected to pressure, and differ from the slender elevated veins of other species. The leaflets are more conspicuously and abruptly acuminate than in *F. (Ornus) retusa*, Champ., or *F. longicuspis*, S. and Z., of which latter species Mr. Sampson has found a single tree near Canton, whether wild or not I cannot say, though I have visited the locality.

5. *Convolvulus translucens*, n. sp.; herbacea, glaberrima, 3–12 pollices long., foliis e basi cordata lanceolatis acutis petiolo lamina triente vel plus breviore suffultis $\frac{1}{2}$–1-pollicaribus lineolis pellucidis creberrime notatis pedunculis unifloris folia æquantibus vel iis dimidio superatis medio bracteis binis minutis subulatis præditis superne incrassatis,

sepalis æqualibus oblongis acutis bilinealibus, corolla calycem duplo excedente, genitalibus inter se æqualibus, corollæ medium attingentibus, stigmatis cruribus brevibus complanatis.—In planitiebus herbosis Mongoliæ citerioris, m. Sept. 1867, invenit Dr. S. W. Williams. (Exsicc. n. 14690.)

A curious little plant, of whose precise affinities I am uncertain. *C. arvensis*, L. var. *sagittifolius*, Turcz. exhibits, though in a much less degree, pellucid markings in the leaves; but our species is at once distinguishable by its dwarf size, exauriculate leaves, short peduncles, acute sepals, and (so far as I could make out from examination of a single flower) broad obtuse stigmas. The flowers seem pinkish, but as blue *Convolvuli* dry of this colour, their hue when fresh is uncertain. Dr. Williams seldom saw a specimen more than a foot long, and it is frequently much smaller. The same gentleman found *C. Ammanni*, Desr., and *C. tragacanthoides*, Turcz., near Kalgan or Chang-chia-kaù, by the Great Wall.

6. *Dracocephalum (Boguldea) rupestre*, n. sp.; caule adscendente piloso, foliis radicalibus et caulinis petiolo iis æquilongo vel parum breviore suffultis oblongis obtusis crenatis e basi cordata in petiolum cuneatim attenuatis utrinque pilosis subtus pallidioribus, floralibus sessilibus e basi cuneata ovatis serratis, verticillastris circ. 8-floris capituliformibus, bracteis cuneato-rhomboideis longe setaceo-serratis calycibus paulo brevioribus, calycis dente supremo obovoideo reliquis linearibus subtriplo latiore omnibus acutissimis, corolla ampla rubescente calyce duplo longiore, antheris glabris.—In rupibus editis ditionis Pekinensis invenit Rev. A. David, miss. apost. (Exsicc. n. 14881.)

This plant, which is probably the unnamed species mentioned in Maximowicz's 'Index Floræ Pekinensis,' is intermediate between *D. altaiense*, Laxm. and *D. grandiflorum*, L. (*chamædryfolium*, Fisch. et Bth.)

7. *Phytolacca Pekinensis*, n. sp.; foliis basi cuneatis oblongis v. obovato-oblongis calloso-apiculatis granulis albidis punctatis 5–7 pollices longis, racemis erectis pollicaribus ovoideo-subglobosis pedicellis flore duplo longioribus, staminibus stylisque 8.—In ditione Pekinensi reperit Dr. S. W. Williams, Augusto 1865. (Exsicc. n. 12648.)

Possibly too close to the Japanese *P. Kæmpferi*, A. Gray; which, however, from a specimen in my possession, seems to differ by its oval leaves and linear-lanceolate racemes 2½–6 inches in length. Dr.

Williams's plant is no doubt the one inaccurately taken for *P. octandra*, by Bunge, and referred with doubt by Maximowicz, in his 'Index Floræ Pekinensis,' to *Pircunia Latbenia*, Moq. I presume this latter is the same as Roxburgh's *Phytolacca acinosa*, of which he has given a very meagre diagnosis, but Moquin has entirely overlooked the name in his monograph of the Order, in the Prodromus.

8. *Polygonum (Echinocaulon) pteropus*, n. sp.; caule angulato lineato crebre retrorsum aculeato ocreis inferioribus membranaceis adpressis basi dense retrorsum aculeolatis apice truncatis setoso-ciliatis superioribus limbo herbaceo orbiculari patente ciliato munitis, foliis inferioribus e basi truncata hastato-trilobis lobis basalibus abbreviatis horizontaliter divaricatis obtusis petiolo margine herbaceo ciliato distincte alato ipso limbo 4-plo breviore infra setuligero suffultis superioribus sensim sessilibus lobisque lateralibus obsoletis omnibus supra passim subtus in nervis strigoso-setosis infra pallidioribus, capitulis geminatis globosis densis, pedunculis setulosis atque glanduloso-hispidis, floribus majusculis 7–8-andris, achænio ovato trigono angulis obtusis faciebus concaviusculis apiculato stramineo opaco oculo armato subtilissime ruguloso.—Ad angustias præcipitis 13 mill. pass. longas, Nankau dictas, secus viam a Peking in Mongoliam ducentem, collegit cl. Dr. S. W. Williams. (Exsicc. n. 14890.)

Closely allied to the Japanese *P. hastato-trilobum*, Meissn., from which it differs by the glandular hairy peduncles, and the winged petioles. It is possible this may be the species mentioned by Maximowicz as having been mistaken by Turczaninow for *P. arifolium*, L.

9. *Aneilema melanostictum*, n. sp.; erectum, 2½–4-pollicare, caudice brevi crasso squamato, foliis lanceolatis acutis amplexantibus basi pilis septatis ciliatis margine cartilagineo albo scabris elevato-nervosis epidermide laxa utrinque rugosissimis atque punctis impressis nigris creberrime notatis, vaginis pilosis, inflorescentia terminali simplici vel dichotoma pauciflora, bracteis ovatis acutis persistentibus hyalino-albis punctis lineolisque badiis conspicue obsitis, floribus parvis cœruleis, staminibus fertilibus 3 filamentis basin versus barbatis, fructu . . . ?—In insula Hænan, Martio 1868, collegit clar. Swinhoe. (Exsicc. n. 14412.)

A very remarkable little species, from its densely black-dotted foliage, something like which is described by Hasskarl (Plant. Junghuhn. 147) in *A. lineolatum*, Kth. It is not half the size of *A. nanum*, and wants

the diffuse habit of that plant, which, however, has similarly dotted bracts, and is perhaps the nearest ally.

10. *Zoysia Sinica*, n. sp.; foliis involutis, spicis lanceolatis 1–1½ poll. longis 2–2½ lin. latis, spiculis laxiusculis subdivergentibus 3-linealibus oblongo-lanceolatis obliquis acutis.—Ad oras Chinæ austro-orientalis usque saltem ad Amoy. (Exsicc. n. 10155.)

This species is the only one I have seen from the coast of China. Mr. Bentham, in the 'Flora Hongkongensis,' has referred to *Z. pungens*, Willd., which, however, from a comparison of Ceylon and South Australian specimens, appears to me abundantly distinct, by its narrow linear spikes and ovate-lanceolate spikelets, only a line or little more long, and so compactly and evenly arranged as to give a tessellated appearance to the spike. *Z. Japonica*, Steud., under which name, with a mark of doubt, I have been accustomed to distribute the Chinese plant, is much nearer *Z. pungens*, and perhaps not sufficiently distinct; but the spike is broader, the spikelets are borne on long pedicels, and are much more laxly arranged, and the leaves are flat, or but slightly involute.

HORACE MANN, CURATOR OF BOTANY IN THE BOSTON SOCIETY OF NATURAL HISTORY.

By William T. Brigham, Esq.

(*From the Proceedings of the Boston Society of Natural History, vol. xii., November* 18, 1868.)

It is sad to speak publicly of our private sorrows, but when those sorrows touch all alike who reverence the good, admire the brave, rejoice over victories in the noble struggle of light against darkness, knowledge against ignorance, or who mourn over great efforts uncompleted, then must we lay aside all thoughts of personal loss, and speak each with all of our common grief.

The youngest officer of this Society has left us never to return. Were years alone the test of usefulness and manhood, we might count over the few that Horace Mann numbered in his earthly life, regret they were so few, and from the full-grown and ripened lives still with us, look for his successor. But vainly should we look; where should we find in all the years the best of our number could show, a single

year so full of hard work, conscientious, unselfish, self-sacrificing struggle that the world might know more, and the cause of science be advanced?

In his earliest youth Horace Mann drew in from his father's careful teachings the love of Nature, which has since been his constant joy. Often would he softly open the door of his father's study, and come silently to his father's side, waiting for the leisure which would give him some of the marvellous stories about the earth and its inhabitants, which in his mind took the place of the unrealities of fairyland so dear to most children.

Chemistry was the delight of his boyhood, and his father's house contained a laboratory, in which he spent many an hour, often to the great anxiety of his family, who dreaded the usual results of boyish experiments with powerful reagents. Inanimate matter did not satisfy him, and after much thought, although opposed by most of his friends, who wished him to receive a collegiate education, he determined to devote himself to the study of Nature, entering Professor Agassiz' school as a student of zoology and geology. This was at the time when the present museum was recently built, and the hard manual labour of moving and arranging heavy specimens, which he so readily undertook, seriously affected his health. He was at this time also deeply interested in conchology, and most especially in botany, and it was from this latter interest that the companionship and friendship commenced, which for the last four or five years have so closely united us. When Dr. Asa Gray was told that I was soon to visit the Hawaiian Islands, he asked me to collect the very peculiar flora of that group, and suggested the propriety of asking Horace Mann to accompany me. It was a short notice, but his friends advised him to go, and he joined me in California. From that time, for more than a year we were constant companions, and many a long ride, many a weary walk, did we share. For more than six months we kept house together in Honolulu, and from the first day to the last he was the same modest, retiring, hard-working, unselfish, conscientious man. Thoroughly alive to all the beauties and wonders of Nature there surrounding him, he often wrote home that he enjoyed every moment, and often indeed have I seen him in perfect ecstasy over the discovery of some new plant after a hard climb up some island precipice.

With his rich collections he returned to Cambridge, and was soon

appointed Dr. Gray's assistant, and afterwards Instructor in Botany in Harvard College. Besides the work of arranging the Thayer Herbarium and constantly aiding Dr. Gray in preparing material for his classes, and revising proofs of his two botanical manuals,—a work more than enough for a common man, a work indeed that no common man could do,—he worked steadily in his spare hours, often late into the night, on his Hawaiian collections. The many thousand specimens were determined and labelled and partly distributed; his 'Enumeration of Hawaiian Plants,' which has given him a good botanical reputation, was published by the American Academy of Arts and Sciences (of which he was unanimously elected a Fellow on the very evening of his decease); a most complete Flora of the islands was published in part by the Essex Institute; several other botanical memoirs were in hand, and you all know that his labour here in our herbarium and in our work as a Society, was not light.

His interest in this Society never waned. Often on shipboard, lying on deck at night, have we talked over this matter, and he was full of suggestions, many of which have since been carried out; others, such as a permanent doorkeeper for the Museum on exhibition days, guide-books to the various collections, and a fire-proof floor for the main story of this building, will be perhaps in time. He was always present at the Council meetings, and his advice was always sensible and respected.

As a result of our Hawaiian explorations, five new genera were added to the flora, one of which was dedicated to him under the name of *Hesperomannia*, and has been engraved for the next part of our Memoirs, while of new species of flowering plants, no less than seventy-one, or more than eleven per cent. of the entire phænogamous Hawaiian flora were discovered. His published works, besides a number of reviews in the 'American Naturalist,' were:—

'On some Hawaiian Crania and Bones.' (Proc. Bost. Soc. Nat. Hist. vol. x. p. 229.)

'On the present condition of Kilauéa and Mauna Lòa.' (*Ibid.* vol. x. p. 229.)

'Denudation on the Hawaiian Islands.' (*Ibid.* vol. x. p. 232.)

'Revision of the Genus *Schiedea* and some of the *Rutaceæ*.' (*Ibid.* vol. x. p. 309.)

'Description of the Crater of Háleakala.' (*Ibid.* vol. xi. p. 112.)

'Enumeration of Hawaiian Plants.' (Proc. Amer. Acad. Arts and Sciences, vol. vii. p. 143.)

'Flora of the Hawaiian Islands.' (Proc. Essex Institute, vol. v.)

The last has not been completed, and a number of other valuable and interesting memoirs remain unfinished.

Early in October the severer symptoms of what he had considered a mere cold, compelled him most unwillingly to give up his college classes, temporarily as we all hoped; but the worst form of pulmonary complaint had gone too far to be stopped, and although his friends all hoped for his recovery, he passed away peacefully on the evening of November 11th, 1868, after some days of great pain and anguish.

Sad as it seems to us, in our blind interpretations of Providence, that a life so full of promise, so pure, so true, a life so short and yet so full of results, should be cut short, yet the example of this life, called so closely to view by the angel of death, cannot but animate and encourage many others; and the nobly proportioned column, whose base and lower shaft alone we see on earth, yet raises its capital above the veiling clouds, a monument and beacon we may well follow.

STATISTICS AND GEOGRAPHICAL RANGE OF HAWAIIAN (SANDWICH ISLANDS) PLANTS.

By Horace Mann, Esq.

The Hawaiian Islands have a surface of about 4000 square miles, situated just within the tropics, and more than one thousand miles from any other land except a few rocks lying to the north-west, bare of vegetation, and inhabited by seafowl and seals. On this area, which includes an excessively dry and hot, a very wet and very hot, and from these every other variety to a very dry and very cold climate, is found a flora of 620 species of flowering plants * and Ferns, of which the former comprise 485 species, the latter 135; the Mosses, Lichens, and Algæ being left out of consideration as too little known.

Of the 554 flowering plants, including 69 species supposed or known to be introduced, 479 species belong to the *Dicotyledonæ*, and the remaining 75 to the *Monocotyledonæ*, in the proportion of nearly

* Omitting *Gramineæ*, which have not yet been fully studied.

100 to 15. These 554 flowering plants are divided among 253 genera, giving to each genus on an average 2·58 species. There are 87 Natural Orders of flowering plants represented in the group. Of the 554 flowering plants 377 are peculiar to the group, while 42 are of recent and 27 of supposed aboriginal introduction, giving the proportion of endemic species 68·05, of introduced (recent) species, 12·46.

Of the 253 genera 39 are peculiar, and these 39 genera are represented by 151 species, or 3·94 species to a genus, while the whole flora has but 2·58 species to each genus; thus showing the important part which these genera take in constituting the whole phænogamous flora.

Among the genera not peculiar to the islands, there are sixteen, of which the species belong to a distinct group in the genus, or which are most largely represented in the South Pacific Islands and Australia, or on the Hawaiian Islands themselves.

Geranium, very peculiar species.
Melicope, either to be reduced to *Pelea*, or if not, entirely Australasian.
Pittosporum, largely Australasian.
Coprosma, a marked New Zealand type.
Acacia, an Australian phyllodinous species.
Gouldia, one other species in Pacific.
Vittadinia, New Zealand and Australia.
Lipochæta, mostly Hawaiian, a few in Mexico.
Scævola, mostly in South Seas and Australasia.
Lobelia, species very peculiar.
Cyrtandra, represented in the South Seas and Moluccas: large genus in the Hawaiian Islands.
Cyathodes, Australasian.
Wikstrœmia, many species Hawaiian, represented in South Seas and Australasia.
Santalum, Western Pacific.
Exocarpus, Australasia and Moluccas.
Astelia, " "

These sixteen genera comprise 76 species, or 4·75 to a genus, thus taking an important place in the flora.

All the species of the following families are peculiar to the group, omitting, of course, species known to be introduced.

Ranunculaceæ.
—Menispermaceæ.
Cruciferæ.
Violaceæ.
—Bixaceæ.
Pittosporaceæ.
Caryophyllaceæ.
Portulacaceæ.
—Camelliaceæ.
—Tiliaceæ.
Geraniaceæ.
Rutaceæ.
—Aquifoliaceæ.
—Celastraceæ.

—Saxifragaceæ.
—Halorageæ.
—Begoniaceæ.
Araliaceæ.
Compositæ.
Lobeliaceæ.
Eriaceæ.
—Ebenaceæ.
—Sapotaceæ.
Myrsinaceæ.
Plantaginaceæ.
Gesneriaceæ.
Solanaceæ.
Labiatæ.
—Myoporineæ.
—Hydrophyllaceæ.
—Gentianaceæ.
Loganiaceæ.
Apocynaceæ.
—Oleaceæ.
Santalaceæ.
—Lauraceæ.
Palmeæ.
Smilacineæ.
Juncaceæ.

Of these, sixteen (marked thus —) are represented by a single species, and the remaining twenty-four families comprise 220 species, or 9·16 species to each genus.

The following families are represented by five or more species:—

Violaceæ, 6.
Caryophyllaceæ, 14.
Malvaceæ, 12.
Geraniaceæ, 5.
Rutaceæ, 17.
Rhamnaceæ, 5.
Pittosporaceæ, 6.
Leguminosæ, 20.
Rosaceæ, 5.
Myrtaceæ, 6.
Cucurbitaceæ, 5.
Araliaceæ, 8.
Rubiaceæ, 33.
Loganiaceæ, 5.
Compositæ, 47.
Lobeliaceæ, 35.
Goodeniaceæ, 6.
Gesneriaceæ, 14.
Labiatæ, 27.
Convolvulaceæ, 12.
Solanaceæ, 9.
Chenopodiaceæ, 5.
Amarantaceæ, 9.
Thymelaceæ, 6.
Piperaceæ, 12.
Urticaceæ, 13.
Cyperaceæ, 39.

Those species belonging to families which are not represented by five or more species, are but ninety-two, belonging to fifty-six families, —less than two species to each family on an average,—while the families in the above list average fourteen species each.

Species peculiar to the Hawaiian Islands:—

Ranunculus Hawaiiensis, *Gray.*
R. Mauiensis, *Gray.*
Nephroica Ferrandiana, *Gray.*
Lepidium Oahuense, *Cham. and Schlecht.*
L. serra, *H. Mann.*
Cleome Sandwicensis, *Gray.*
Viola Kavaiensis, *Gray.*
V. Mauiensis, *H. Mann.*
V. Chamissoniana, *Ging.*

Isodendrion pyrifolium, *Gray.*
I. longifolium, *Gray.*
I. laurifolium, *Gray.*
Xylosma Hawaiiensis, *Seem.*
Pittosporum confertiflorum, *Gray.*
P. cauliflorum, *H. Mann.*
P. terminalioides, *Planchon.*
P. spathulatum, *H. Mann.*
P. glabrum, *Hook. and Arn.*
P. acuminatum, *H. Mann.*
Silene struthioloides, *Gray.*
S. lanceolata, *Gray.*
Schiedea Nuttallii, *Hook.*
S. diffusa, *Gray.*
S. amplexicaulis, *H. Mann.*
S. stellarioides, *H. Mann.*
S. Menziesii, *Hook.*
S. Hookeri, *Gray.*
S. ligustrina, *Cham. and Schlecht.*
S. spergulina, *Gray.*
S. Remyi, *H. Mann.*
S. globosa, *H. Mann.*
S. viscosa, *H. Mann.*
Alsinidendron trinerve, *H. Mann.*
Portulaca villosa, *Cham.*
P. sclerocarpa, *Gray.*
Eurya Sandwicensis, *Gray.*
Gossypium tomentosum, *Nutt.*
G. drynarioides, *Seem.*
Hibiscus Youngianus, *Gaud.*
H. Brackenridgei, *Gray.*
H. Arnottianus, *Gray.*
H., n. sp.
Abutilon incanum, *Don.*
A. Menziesii, *Seem.*
Sida sertum, *Nutt.*
S. Meyeniana, *Walp.*
Waltheria pyrolæfolia, *Gray.*
Elæocarpus bifidus, *Hook. and Arn.*
Geranium multiflorum, *Gray.*
G. cuneatum, *Hook.*
G. ovatifolium, *Gray.*
G. arboreum, *Gray.*
Pelea clusiæfolia, *Gray.*
P. sapotæfolia, *H. Mann.*
P. auriculæfolia, *Gray.*
P. Kavaiensis, *H. Mann.*
P. anisata, *H. Mann.*
P. oblongifolia, *Gray.*
P. rotundifolia, *Gray.*
P. Sandwicensis, *Gray.*
P. volcanica, *Gray.*
Melicope cinerea, *Gray.*
M. barbigera, *Gray.*
M. spathulata, *Gray.*
M. elliptica, *Gray.*
Platydesma campanulata, *H. Mann.*
Zanthoxylum Kavaiense, *Gray.*
Z. Mauiense, *H. Mann.*
Z. (Blackburnia) dipetalum, *H. Mann.*
Byronia Sandwicensis, *Endl.*
Perrottetia Sandwicensis, *Gray.*
Colubrina oppositifolia, *Brongn.*
Gouania vitifolia, *Gray.*
G. orbicularis, *Walp.*
Dodonæa eriocarpa, *Smith.*
Sesbania tomentosa, *Hook. and Arn.*
Desmodium Sandwicensis, *E. Meyer.*
Vicia Menziesii, *Spreng.*
Erythrina monosperma, *Gaud.*
Canavalia galeata, *Gaud.*
Vigna Oahuensis, *Vogel.*
V. Sandwicensis, *Gray.*
Sophora chrysophylla, *Seem.*
Cæsalpinia Kavaiensis, *H. Mann.*
Cassia Gaudichaudii, *Hook. and Arn.*
Acacia Koa, *Gray.*
Rubus Hawaiiensis, *Gray.*
R. Macræi, *Gray.*
Acæna exigua, *Gray.*
Broussaisia arguta, *Gaud.*
Gunnera petaloidea, *Gaud.*
Metrosideros rugosa, *Gray.*
M. macropus, *Hook. and Arn.*
Eugenia Sandwicensis, *Gray.*
Sicyos pachycarpus, *Hook. and Arn.*
S. macrophyllus, *Gray.*
S. cucumerinus, *Gray.*
S. microcarpus, *H. Mann.*
Hillebrandia Sandwicensis, *Oliver.*
Hedera Gaudichaudii, *Gray.*
H. platyphylla, *Gray.*

Heptapleurum Kavaiense, *H. Mann.*
Dipanax Mannii, *Seem.*
Reynoldsia Sandwicensis, *Gray.*
Tetraplasandra Hawaiiensis, *Gray.*
Triplasandra Oahuensis, *Gray.*
Coprosma rhynchocarpa, *Gray.*
C. longifolia, *Gray.*
C. foliosa, *Gray.*
C. pubens, *Gray.*
C. Menziesii, *Gray.*
C. ernodeoides, *Gray.*
Psychotria hexandra, *H. Mann.*
P. grandiflora, *H. Mann.*
Straussia Kaduana, *Gray.*
S. Mariniana, *Gray.*
S. Hawaiiensis, *Gray.*
Bobea elatior, *Gaud.*
B. brevipes, *Gray.*
Guettardella Sandwicensis, *H. Mann.*
Gardenia Brighami, *H. Mann.*
G. Remyi, *H. Mann.*
Gouldia Sandwicensis, *Gray.*
Kadua laxiflora, *H. Mann.*
K. centranthoides, *Hook. and Arn.*
K. glomerata, *Hook. and Arn.*
K. cordata, *Cham. and Schlecht.*
K. Cookiana, *Cham. and Schlecht.*
K. parvula, *Gray.*
K. glaucifolia, *Gray.*
K. Menziesiana, *Cham. and Schlecht.*
K. acuminata, *Cham. and Schlecht.*
K. petiolata, *Gray.*
K. grandis, *Gray.*
Lagenophora Maviensis, *H. Mann.*
Aster Sandwicensis, *Gray.*
Vittadinia humilis, *Gray.*
V. tenerrima, *Gray.*
V. Remyi, *Gray.*
V. Chamissonis, *Gray.*
V. consanguinea, *Gray.*
V. arenaria, *Gray.*
V. conyzoides, *Gray.*
Coreopsis Maviensis, *Gray.*
C. macrocarpa, *Gray.*
C. Macræi, *Gray.*
C. cosmoides, *Gray.*
C. Menziesii, *Gray.*
C. micrantha, *Gray.*
Bidens Sandwicensis, *Less.*
B. Hawaiiensis, *Gray.*
Lipochæta australis, *Gray.*
L. subcordata, *Gray.*
L. calycosa, *Gray.*
L. lavarum, *DC.*
L. integrifolia, *Gray.*
L. succulenta, *DC.*
L. heterophylla, *Gray.*
L. tenuifolia, *Gray.*
L. micrantha, *Gray.*
L. Remyi, *Gray.*
Argyroxiphium Sandwicense, *DC.*
A. macrocephalum, *Gray.*
Wilkesia gymnoxiphium, *Gray.*
Dubautia plantaginea, *Gaud.*
D. laxa, *Hook. and Arn.*
D. paleata, *Gray.*
Raillardia latifolia, *Gray.*
R. scabra, *DC.*
R. laxiflora, *DC.*
R. ciliolata, *DC.*
R. Hillebrandi, *H. Mann.*
R. linearis, *Gaud.*
R. Menziesii, *Gray.*
R. platyphylla, *Gray.*
R. arborea, *Gray.*
R. montana, *H. Mann.*
R. struthioloides, *Gray.*
Hesperomannia arborescens, *Gray.*
Rollandia lanceolata, *Gaud.*
R. crispa, *Gaud.*
R. Humboldtiana, *Gaud.*
Delissea clermontioides, *Gaud.*
D. coriacea, *Gray.*
D. obtusa, *Gray.*
D. hirtella, *H. Mann.*
D. acuminata, *Gaud.*
D. angustifolia, *Presl.*
D. rhytidosperma, *H. Mann.*
D. arborea, *H. Mann.*
D. subcordata, *Gaud.*
D. undulata, *Gaud.*
D. platyphylla, *Gray.*

D. racemosa, *H. Mann.*
D. calycina, *Presl.*
D. pinnatifida, *Presl.*
D. ambigua, *Presl.*
D. Mannii, *Brigham.*
D. fissa, *H. Mann.*
D. pilosa, *Gray.*
D. asplenifolia, *H. Mann.*
Cyanea aspera, *Gray.*
C. arborescens, *H. Mann.*
C. lobata, *H. Mann.*
C. Grimesiana, *Gaud.*
C. leptostegia, *Gray.*
C. tritomantha, *Gray.*
C. superba, *Gray.*
Clermontia grandiflora, *Gaud.*
C. parviflora, *Gaud.*
Brighamia insignis, *Gray.*
Lobelia macrostachys, *Hook and Arn.*
L. Gaudichaudii, *DC.*
L. neriifolia, *Gray.*
Scævola coriacea, *Nutt.*
S. Gaudichaudii, *Hook. and Arn.*
S. Chamissoniana, *Gaud.*
S. mollis, *Hook. and Arn.*
S. glabra, *Hook. and Arn.*
Vaccinium reticulatum, *Smith.*
V. penduliflorum, *Gaud.*
Cyathodes imbricata.
Maba Sandwicensis, *DC.*
Sapota Sandwicensis, *Gray.*
Myrsine Gaudichaudii, *DC.*
M. Lessertiana, *DC.*
M. Sandwicensis, *DC.*
Lysimachia Hillebrandi, *Hook.*
Plantago princeps, *Cham. and Schlecht.*
P. pachyphylla, *Gray.*
Cyrtandra cordifolia, *Gaud.*
C. platyphylla, *Gray.*
C. Pickeringii, *Gray.*
C. triflora, *Gaud.*
C. grandiflora, *Gaud.*
C. ænobarba, *H. Mann.*
C. Lessoniana, *Gaud.*
C. paludosa, *Gaud.*
C. Garnottiana, *Gaud.*
C. laxiflora, *H. Mann.*
C. Macræi, *Gray.*
C. Menziesii, *Hook. and Arn.*
C., n. sp.
C., n. sp.
Solanum Nelsoni, *Duval.*
S. Sandwicense, *Hook. and Arn.*
S. incompletum, *Duval.*
Lycium Sandwicense, *Gray.*
Nothocestrum latifolium, *Gray.*
N. longifolium, *Gray.*
N. brevifolium, *Gray.*
N. subcordatum, *H. Mann.*
Sphacele hastata, *Gray.*
Phyllostegia vestita, *Benth.*
P. grandiflora, *Benth.*
P. brevidens, *Gray.*
P. glabra, *Benth.*
P. hirsuta, *Benth.*
P. parviflora, *Benth.*
P. rosmarinifolia, *H. Mann.*
P. stachyoides, *Gray.*
P. clavata, *Benth.*
P. racemosa, *Benth.*
P. haplostachya, *Gray.*
P. Hillebrandi, *H. Mann.*
P. truncata, *Gray.*
P. floribunda, *Benth.*
Stenogyne macrantha, *Benth.*
S. rotundifolia, *Gray.*
S. cordata, *Benth.*
S. sessilis, *Benth.*
S. calaminthoides, *Gray.*
S. scrophularioides, *Benth.*
S. purpurea, *H. Mann.*
S. rugosa, *Benth.*
S. angustifolia, *Gray.*
S. parviflora, *H. Mann.*
S. microphylla, *Benth.*
S. crenata, *Gray.*
S. diffusa, *Gray.*
Myoporum Sandwicense, *Gray.*
Nama Sandwicense, *Gray.*
Jacquemontia Sandwicensis, *Gray.*
Bonamia Menziesii, *Gray.*
Cuscuta Sandwichiana, *Choisy.*

Erythræa sabæoides, *Gray*.
Labordea fagræoidea, *Gaud*.
L. pallida, *H. Mann*.
L. hirtella, *H. Mann*.
L. membranacea, *H. Mann*.
L. tinifolia, *Gray*.
Alyxia olivæformis, *Gaud*.
Rauwolfia Sandwicensis, *DC*.
Ochrosia Sandwicensis, *DC*.
O., n. sp.
Olea Sandwicensis, *Gray*.
Rumex giganteus, *Ait*.
Santalum Freycinetianum, *Gaud*.
S. pyrularium, *Gray*.
Exocarpus Gaudichaudii, *DC*.
Oreodaphne Kavaiensis, *H. Mann*.
Wikstrœmia elongata, *Gray*.
W. fœtida, *Gray*.
W. Sandwicensis, *Meisn*.
W. Uva-ursi, *Gray*.
W. buxifolia, *Gray*.
W. phillyræfolia, *Gray*.
Chenopodium Sandwichieum, *Moq*.
Ptilotus Sandwicensis, *Gray*.
Charpentiera ovata, *Gaud*.
Urtica Sandwicensis, *Wedd*.
Urera glabra, *Wedd*.
U. Sandwicensis, *Wedd*.
Bœhmeria stipularis, *Wedd*.
Pipturus albidus, *Gray*.
Neraudia melastomæfolia, *Gaud*.
N. sericea, *Gaud*.
Touchardia latifolia.
Euphorbia clusiæfolia, *Hook. and Arn*.
E. Remyi, *Gray*.
E. multiformis, *Gaud*.
E. Hookeri, *Steud*.
E. cordata, *Meyen*.
Antidesma platyphyllum, *H. Mann*.
Phyllanthus distichus, *Hook. and Arn*.
Claoxylon Sandwicensis, *Müll*.
Peperomia pallida, *A. Dietr*.
P. membranacea, *Hook. and Arn*.
P. Gaudichaudii, *Miq*.
P. Sandwicensis, *Miq*.
P. insularum, *Miq*.
P. latifolia, *Miq*.
P. hypoleuca, *Miq*.
P. Macræana, *Miq*.
P. leptostachya, *Hook. and Arn*.
P., n. sp.
Pritchardia Martii, *Wendl*.
P. Gaudichaudii, *Herm. Wendl*.
P., n. sp.
Freycinetia arborea, *Gaud*.
Sisyrinchium acre, *H. Mann*.
Smilax Sandwicensis, *Kunth*.
S. anceps, *Willd*.
S., sp. alt. [*Vide* Journ. of Bot. VI. 193.]
Anæctochilus Sandwicensis, *Lindl*.
A. Jaubertii, *Gaud*.
Liparis Hawaiiensis, *H. Mann*.
Dracæna aurea, *H. Mann*.
Astelia Menziesiana, *Smith*.
A. veratroides, *Gaud*.
Joinvillea ascendens, *Gaud*.
Cyperus trachysanthos, *Hook. and Arn*.
C. Prescottianus, *Hook. and Arn*.
C. caricifolius, *Hook. and Arn*.
C. multiceps, *Hook. and Arn*.
C. Kunthianus, *Gaud*.
C. phleoides, *Nees*.
C. Hawaiiensis, *H. Mann*.
Rhynchospora lavarum, *Gaud*.
R. thyrsoidea, *Nees and Meyen*.
Cladium leptostachyum, *Nees and Meyen*.
Baumea Meyenii, *Kunth*.
Vincentia angustifolia, *Gaud*.
Gahnia Gaudichaudii, *Steud*.
G. Beecheyi, *H. Mann*.
G. globosa, *H. Mann*.
Oreobolus furcatus, *H. Mann*.
Scleria testacea, *Nees*.
Carex Commersoniana, *Gilb*.
C. Meyenii, *Nees*.
C. Oahuensis, *C. A. Meyer*.
C. nuptialis, *Boot*.
C. Prescottiana, *Boot*.
Uncinia Lindleyana, *Kunth*.

Panicum nephelophilum, *Gaud.*[1]
P. montanum, *Gaud.*
P. pellitum.
P. tenuifolium, *Hook. and Arn.*
P. Beecheyi.
P. isachnoides, *Munro.*
Poa Oahuensis, *Kunth.*
P. monticola, *Kunth.*
P. variabilis, *Kunth.*
P., sp.
P., sp. alt.
Isachne distichophylla, *Munro.*
Cenchrus agrimonioides, *Munro.*
Garnottia patula, *Munro.*
Agrostis Sandwicensis, *Munro.*
Calamagrostis, sp.
Trisetum glomeratum, *Munro.*
Eragrostis nana, *Munro.*
Festuca, sp.
Schizostachyum decompositum, *Munro.*
Kœleria glomerata, *Kunth.*

Plants not peculiar to the Hawaiian Islands, and not introduced by Whites.

—Cardamine hirsuta, *L.*
—Senebiera didyma, *Pers.*
—Capparis Sandwicensis, *DC.*
—Sesuvium Portulacastrum, *L.*
†Calophyllum Inophyllum, *L.*
—Gossypium religiosum, *L.*
—Hibiscus tiliaceus, *L.*
Thespesia populnea, *Corr.*
—Sida fallax, *Walp.*
S. rhombifolia, *L.*
Malvastrum tricuspidatum, *Gray.*
—Waltheria Americana, *L.*
—Tribulus cistoides, *L.*
Colubrina Asiatica, *Brongn.*
Alphitonia excelsa, *Reissek.*
Dodonæa viscosa, *L.*
—†Cardiospermum Halicacabum, *L.*
Rhus semialatum, *Murr.*
†Crotalaria sericea, *Retz.*
—†Tephrosia piscatoria, *Pers.*
†Sesbania grandiflora, *Poir.*
—*Desmodium triflorum, *DC.*
Strongylodon lucidum, *Seem.*
Dioclea violacea, *Mart.*
Mucuna gigantea, *DC.*
M. urens, *DC.*
*Phaseolus Truxillensis, *H. B. K.*
*P. semierectus, *L.*
Vigna lutea, *Gray.*
†Dolichos Lablab, *L.*
†Cajanus Indicus, *Spreng.*
Cæsalpinia (Guilandina) Bonduc, *Benth.*
Osteomeles anthyllidifolia, *Lindl.*
Drosera longifolia, *L.*
Metrosideros polymorpha, *Gaud.*
†Psidium Guajava, *L.*
Eugenia (Jambosa) Malaccensis, *L.*
Lythrum maritimum, *H. B. K.*
Cuphea balsamona, *Cham. and Schlecht.*
—†Jussiæa villosa, *L.*
Lagenaria vulgaris, *Ser.*
Cucurbita maxima, *Duch.*
†Papaya vulgaris, *DC.*
Hydrocotyle interrupta, *Muhl.*
Viscum moniliforme, *Blume.*
Nertera depressa, *Banks.*
†Richardsonia scabra, *St. Hil.*
Pæderia fœtida, *L.*
Canthium lucidum, *Hook. and Arn.*
—†Morinda citrifolia, *L.*
Adenostemma viscosum, *Forst.*
—*Ageratum conyzoides, *L.*

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[1] The Grasses are still in the hands of General Munro, and therefore only this very imperfect list can be given.—W. T. B.

Gnaphalium albo-luteum, *L.*
*Sonchus asper, *L.*
—Scævola sericea, *Forst.*
Cyathodes Kamehamehæ, *Cham.*
C. imbricata, *Stschelglew.*
Lysimachia lineariloba, *Hook. and Arn.*
—Plumbago Zeylanica, *L.*
Solanum oleraceum, *Dunal.*
—S. aculeatissimum, *Jacq.*
—S. nigrum, *L.*
Physalis Peruviana, *L.*
Herpestis Monniera, *H. B. K.*
—Plectranthus parviflorus, *Willd.*
—*Priva aspera, *H. B. K.*
—*Vitex trifolia, *L.*
—†Cordia subcordata, *Lam.*
—Heliotropium anomalum, *Hook. and Arn.*
— H. Curassavicum, *L.*
Batatas acetosæfolia, *Choisy.*
†B. edulis, *Choisy.*
B. pentaphylla, *Choisy.*
Ipomœa Bona-nox, *L.*
I. insularis, *Steud.*
— I. Pes-capræ, *Sweet.*
I. Turpethum, *R. Br.*
I. Forsteri, *Gray.*
I. palmata, *Forsk.*
Cressa Cretica, *L.*
— Vinca rosea, *L.*
Pisonia grandis, *Parkinson.*
P. excelsa, *Blume.*
— Bœrhaavia diffusa, *L.*
Rumex longifolius? *Gray.*
—*Polygonum glabrum, *Willd.*
Cassytha filiformis, *L.*
— Chenopodium murale, *L.*
— C. album, *Moq.*
— C. ambrosioides, *L.*
— Batis maritima, *L.*
†Basella rubra, *L.*
Achyranthes splendens, *Mart.*
— A. bidentata, *Blume.*
A. velutina, *Hook. and Arn.*
Aerva sericea, *Moq.*
— Euxolus viridis, *L.*[1]
— E. lineatus, *Moq.*
— Fleurya interrupta, *Gaud.*
Pilea peploides, *Hook. and Arn.*
— Artocarpus incisa, *L.*
— Broussonettia papyrifera, *Vent.*
Morus pendulina, *Endlich.*
†M. Indica, *Rumph.*
Euphorbia Atoto, *Forst.*
—*E. pilulifera, *L.*
*E. Heliscopia, *L.*
*Phyllanthus Niruri, *L.*
Aleurites Moluccana, *Willd.*
Manihot utilissima, *Pohl.*
†Ricinus communis, *L.*
†Piper methysticum, *Forst.*
Cocos nucifera, *L.*
— Pandanus verus, *Rumph.*
Colocasia esculenta, *Schott.*
Alocasia macrorhiza, *Schott.*
Tacca pinnatifida, *Forst.*
— Naias major, *All.*
— Ruppia maritima, *L.*
— Potamogeton Gaudichaudii, *Cham.*
— P. Hawaiiensis, *Cham.*
— P. pauciflorus, *Pursh.*
Musa —— sp.
†M. —— sp. alt.
— Zingiber Zerumbet, *Ross.*
*Canna Indica, *L.*
†Helmia bulbifera, *Kunth.*
†Dioscorea pentaphylla, *L.*
Commelyna Cayennensis, *Rich.*
*Tradescantia floribunda, *Kunth.*
Cordyline terminalis, *Kunth.*
Dianella odorata, *Blume.*
Luzula campestris, *DC.*
— Cyperus mucronatus, *Rottb.*
C. brunneus, *Sw.*
C. polystachus, *Rottb.*

[1] This should rather be placed among the plants accidentally introduced in recent time.—W. T. B.

Cyperus pennatus, *Lam.*
C. viscosus, *Ait.*
C. cæspitosus, *Poir.*
C. paniculatus, *Hook. and Arn.*
C. strigosus, *L.*
C. auriculatus, *Nees and Meyen.*
*Kyllingia monocephala, *Rottb.*
Elæocharis obtusa, *Schult.*
E. palustris, *R. Br.*
— Scirpus maritimus, *L.*
— S. riparius, *Presl.*
Fimbristylis cymosa, *R. Br.*
— F. umbello-capitata, *Steud.?*
Gahnia globosa, *H. Mann.*
Carex festiva, *Dewey.*

Species marked with a dagger (†) are perhaps of aboriginal introduction; those marked with an asterisk (*) possibly of recent introduction; those marked with a dash (—) are *par excellence* lowland and maritime.

For convenience, the flora of the Hawaiian Islands may be divided into five regions: the dry alluvial plains on the shore or *Maritime Region*, the *Lowland Region*, *Higher Wooded Region*, *Wet Mountain Region*, and *Dry Mountain Region.*[1]

I. Maritime Region. Besides the plants in the previous list, the following are characteristic of this zone:—

Cleome Sandwicensis.
Hibiscus Youngianus.
Erythrina monosperma.
Lipochæta succulenta.
Lycium Sandwicense.
Nama Sandwicensis.
Erythræa sabæoides.
Pritchardia, sp.

II. Lowland Region. This extends to about 1000 feet above the sea, and is principally characterized by *Aleurites Moluccana*, *Jambosa Malaccensis*, *Hibiscus tiliaceus*, *Pandanus odoratissimus*, and *Cordia subcordata.*

Capparis Sandwicensis.
Abutilon incanum.
Sida fallax.
Hibiscus Youngianus.
H. tiliaceus.
Gossypium (three species).
Tribulus cistoides.
Waltheria Americana.
Oxalis corniculata.
O. Martiana.
Cardiospermum Halicacabum.
Eugenia Malaccensis.
Lythrum maritimum.
Jussiæa villosa.
Sicyos cucumerinus.
Morinda citrifolia.
Adenostemma viscosum.
Vittadinia arenaria.
V. conyzoides.
Erigeron Canadense.

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[1] Jules Remy distinguishes five zones thus: Littoral, Tropical (from the base of the hills to the forests), Forest, Mountainous or Subalpine, and Alpine. The absence of anything like an Alpine region will be evident on inspection of the above lists.—W. T. B.

Scævola sericea.
Plumbago Zeylanica.
Physalis Peruviana.
Plectranthus parviflorus.
Myoporum Sandwicense.
Cordia subcordata.
Ipomœa Bona-nox.
I. insularis.
I. palmata.
Cuscuta Sandwichiana.
Bœrhaavia diffusa.
Santalum ellipticum (var.).
Chenopodium (three species).
Euxolus lineatus.
Euphorbia multiformis.
Aleurites Moluccana.
Ricinus communis.
Tacca pinnatifida.
Zingiber Zerumbet.
Cordyline terminalis.

III. Higher Wooded Region. This is the forest region. The following species are found here; those marked * in the higher part. Only those marked — are not endemic.

*Ranunculus Hawaiiensis.
*R. Mauiensis.
Nephroica Ferrandianus.
Lepidium serra.
— Cardamine hirsuta.
Viola Chamissoniana.
Isodendrion (all of the species).
Xylosma Hawaiiense.
Pittosporum (all of the species).
Silene lanceolata.
Schiedea (most of the species).
— Alsinidendron trinerve.
Calophyllum Inophyllum.
Eurya Sandwicensis.
Hibiscus Brackenridgii.
H. Arnottianus.
Sida Meyeniana.
Elæocarpus bifidus.
*Geranium arboreum.
Pelea (all of the species).
Melicope (all of the species).
Platydesma campanulata.
Zanthoxylon (all of the species).
Byronia Sandwicensis.
Perrottetia Sandwicensis.
Colubrina oppositifolia.
— Alphitonia excelsa.
— Dodonæa viscosa.
— Rhus semialatum.
Vicia Menziesii.
— Strongylodon lucidum.
— Mucuna (both species).
— Dioclea violacea.
— Canavalia galeata.
Vigna Oahuensis.
V. Sandwicensis.
— Cæsalpinia Bonduc.
C. Kavaiensis.
Acacia Koa.
Cassia Gaudichaudii.
*Rubus (both species).
Osteomeles anthyllidifolia.
Broussaisia arguta.
Metrosideros (all of the species).
Psidium Guajava.
Eugenia Sandwicensis.
Sicyos (all of the species).
Hillebrandia Sandwicensis.
Sanicula Sandwicensis.
Hedera Gaudichaudii.
Heptapleurum Kavaiense.
Dipanax Mannii.
Reynoldsia Sandwicensis.
Tetraplasandra Hawaiiensis.
Triplasandra Oahuensis.
Viscum moniliforme.
Coprosma (all of the species except *pubens*).
Canthium lucidum.
Psychotria (both species).
Straussia (all of the species).
Bobea (both species).

Guettardella Sandwicensis.
Gardenia Brighami.
G. Remyi.
Gouldia Sandwicensis.
Kadua (all of the species).
Adenostemma viscosum.
Coreopsis macrocarpa.
C. Macræi.
C. cosmoides.
Bidens Sandwicensis.
B. Hawaiiensis.
Lipochæta australis.
Dubautia (all of the species).
Raillardia latifolia.
R. scabra.
R. laxiflora.
R. Hillebrandii.
Hesperomannia arborescens.
Rollandia (all of the species).
Delissea (seventeen species).
Cyanea (six species).
Clermontea (both species).
Brighamia insignis.
Scævola Gaudichaudii.
S. Chamissoniana.
S. mollis.
S. glabra.
Vaccinium penduliflorum.
Cyathodes (both species).
Maba Sandwicensis.
Sapota Sandwicensis.
Myrsine (all of the species).
Lysimachia (both species).
Plantago princeps.
P. pachyphylla.
Cyrtandra (all of the species).
Solanum Sandwicense.
S. incompletum.
Nothocestrum (all of the species).
Phyllostegia (most of the species).
*Sphacele hastata.
Stenogyne (most of the species).
Myoporum Sandwicense.
Ipomœa tuberculata.

Ipomœa Bona-nox.
Bonamia Menziesii.
Cuscuta Sandwichiana.
Alyxia olivæformis.
Rauwolfia Sandwicensis.
Ochrosia Sandwicensis.
Olea Sandwicensis.
— Pisonia (both species).
— Phytolacca Bogotensis.
Rumex giganteus.
Santalum (two species).
Exocarpus Gaudichaudii.
Oreodaphne Kavaiensis.
Wikstrœmia (three species).
Ptilotus Sandwicensis.
Fleurya interrupta.
Urera (both species).
Pilea peploides.
Bœhmeria stipularis.
Neraudia melastomæfolia.
Touchardia latifolia.
Morus pendulina.
Euphorbia clusiæfolia.
E. Remyi.
E. Hookeri.
Antidesma platyphyllum.
Phyllanthus distichus.
Claoxylon Sandwicensis.
Peperomia (most of the species).
Pritchardia (two species).
Freycinetia arborea.
Smilax (three species).
Commelyna Cayennensis.
*Anæchtochilus (two species).
Liparis Hawaiiensis.
Dracæna aurea.
— Cordyline terminalis.
Dianella odorata.
Astelia (two species).
Joinvillea ascendens.
Gahnia Beecheyi.
G. globosa.
Uncinia Lindleyana.

IV. Mountain Region. Wet and wooded between the lower and higher cloud level, 3500–6000 feet.

Metrosideros polymorpha (dwarf).
Gunnera petaloidea.
Coprosma pubens.
Labordea fagræoides.
Vittadinia (several species).
Hedera platyphylla.
Astelia Meyeniana.

V. Upper Mountain Region. A small region on the summits of West Máui and Kauaì, which lies above 6000 feet, and which is not wooded.

Viola Kavaiensis.
V. Maviensis.
Geranium cuneatum var. hololeucum.
Drosera longifolia.
Acæna exigua.
Lagenophora Maviensis.
Argyroxiphium (two species).
Wilkesia gymnoxiphium.
Raillardia montana.
Lobelia Gaudichaudii.
Vaccinium reticulatum.
Oreobolus furcatus.
and some Gramineæ.

(*From the Memoirs of the Boston Society, vol. i. part iv.* 1869.)

REPORT OF THE VICTORIAN GOVERNMENT BOTANIST AND DIRECTOR OF THE MELBOURNE BOTANIC GARDEN.

Botanic Garden, Melbourne,
14*th September*, 1868.

Sir,

In compliance with your request, I have the honour of transmitting to you a succinct general Report on the work more recently performed in the Botanic Garden and its scientific institutions. Simultaneously, I beg to point out what measures of progressive improvements might most advantageously occupy the attention of the establishment during the next year.

Since the great excavations at the Garden lake, and the earthworks connected therewith, were completed, it became possible, within the means available, to finish the various lines of walks, which now extend in the aggregate over 22½ miles. All of these are lined with trees, unless they pass along special garden land.

A considerable extent of these walks requires, however, yet to be

somewhat raised and to be covered with a gravel-layer, or perhaps with clayey grit, which is far more accessible, and will bind into a firm mass, impervious to rain. A large portion of the main drive from the City Bridge to Anderson Street, needs yet to be macadamized, and basalt boulders might be used to mark off lastingly its footpaths.

The tree lines along the walks amount altogether now to 21 miles; also, different kinds of trees have recently been chosen for these avenues, to exhibit the relative merits of each. The remaining portion of the reserve between the City Bridge and the Botanic Garden has latterly also been planted with many additional kinds of Pines—not less than 21,000 Pines, representing very many species, being now grouped or scattered on the lawns. To prevent more completely a certain degree of monotony, which might be caused by the massive upgrowth of Conifers, though many are of very distinct form, and though lines of deciduous trees dissect the lawns, I introduced into the incipient pinetum several hundreds of New Zealand Palm-lilies (*Cordyline Australis* and *C. indivisa*), and also numerous groups of real Palms,—for instance, the Gippsland Fan-Palm, the New Zealand Nika-Nika, the Date, the Seaforthia, the Sabal, and a few others equally hardy. Many of these Palms or palm-like plants have become already very conspicuous, and it may be readily foreseen that, within a few years, the environs of the city will assume by this measure an aspect so exotic, that a visitor viewing the suburban landscape will imagine himself to be within the tropics. To the Palm groves require still to be added in quantity the Chilian Jubæa and the equally hardy Chinese Livistonia. The various trees will form a nucleus for forest culture when gradually bearing seeds, and when not merely the protection but also the enrichment of the native forests will become an object of legislative enactments. The total number of trees now planted out approaches to 30,000. The Willow plantations along both the Yarra banks, from Prince's Bridge to Richmond, have been renewed or completed this year on the municipal side of the river by the aid of the Corporation. The renewal of the fences since the last floods, effected at great expense by the City Council, has afforded for this purpose all the necessary security. Weeping Willows and various kinds of Basket Willows have been chosen promiscuously to combine ornament with utility.

A dense belt of vegetation will thus guard against accidents, embel-

lish the river, consolidate the banks, afford more shade, shelter the Garden against the piercing westerly winds, and replace permanently the fences, apt to be carried away by the floods.

Tall Danubian Reeds, Callas, patches of Tea-tree (*Melaleuca ericifolia*, transferable in an upgrown state), Poplars, Ashes, Elms, Oaks, all of various kinds, Toi-Toi, Pampas Grass, Tamarix, Ampelodesmos, Wiry Muehlenbeckia, *Poa ramigera*, will ere long impress on the once dismal swamps and river banks a smiling feature.

The many thousand large plants required for this purpose were partly supplied by donations or interchanges. Clover and Lucerne are also established on the lagoons and even on the rises.

To render, in our zone of evergreen vegetation, the Yarra valley no longer of a wintery, leafless aspect, the City Council very kindly allowed a strip of ground all along the northern banks to be ploughed for the reception of seeds of such quick-growing evergreen trees (chiefly Eucalypts, Acacias, Exocarpus, and Casuarinas) as will resist those occasional inundations to which we are still likely to be exposed, unless many more of the ledges of rocks across the Yarra are blasted away, to decrease still further the niveau of the river,—a measure which the still rapid fall during floods will admit of.

To secure the lower part of the Garden against such calamities and destructions as were experienced during the last four floods, it will be necessary to raise the river bank still three to four feet higher, perhaps with the formation of a terrace, although the embankment has been heightened already all along the Garden to the extent of several feet. This security could, however, not be afforded on the expansive flat next to the City Bridge without serious impediment to the flood stream; but the swampy ground, now with the change of seasons wet and dry, will absolutely need deepening in several places, and raising (under formation of islands and such like ornamentation) in other spots, inasmuch as localities on which the area of dry land and of ponds is not properly defined, are prone to originate, by algic growth, malarian fevers. Consequently, on grounds of sanitary necessity alone, I feel bound to recommend this measure.

A spacious sluice was built, by Garden labour, last year, to admit of the sudden filling of the Garden lake whenever the river rapidly rises, in order that the demolition of the embankments of the lake may in future be obviated.

The tall Indian Bamboo has been acclimatized, and is, with other *Bambusaceæ* and the Nile Papyrus, chosen to fringe the lake. In a climate like ours, which admits of the culture of so many tropical plants without glass protection, it is always an important object to group the greatest possible number of prominently remarkable plants from various parts of the globe suitably together. This, indeed, is one of the greatest charms in our horticulture. Throughout the Garden ground numerous new species have been added annually, predominance being given to such shrubs and perennial plants as entail the least attention for maintenance. Were it otherwise, so extensive an area could not be maintained in sightliness, whilst here throughout the year the growth of weeds, annually more diversified, is to be coped with. And even now it is unavoidable to cover the central portions of all the shrubberies densely with perennial grasses, an operation which could not have been effected a few years ago, because the plants, then small, would have become suffocated. Plantations have also been formed at the stately girder-bridge, a structure which reflects high credit on the Department of Public Works. Whenever the lower part of Anderson Street is to be filled up, then the dyke now forming the approach to the bridge ought to be reduced.

The whole area of the Garden and arboreta now laid out comprises nearly 400 acres, including the lake with its six islands. To the latter, a seventh requires to be added, on the north-western extremity. By the extensive excavations on the lagoon, the once inundated Eastern Tea-tree ground has now been completely reclaimed, and forms a miniature forest, readily accessible to picnic parties from the river. Turf soil is by these means also easily obtained for Nursery culture. The work connected with the excavations also enabled me to establish passages across three of the bends of the lake, whereby the distance from point to point has been conveniently lessened. It allowed, also, widening the causeway and securing good soil for the Garden. Unrestricted access for carriages is given to all the rising ground in the reserve, from which such panoramic views may be enjoyed over the city, suburban landscapes, and bay; and it is anticipated that, whilst from year to year the park trees will afford augmented shade and shelter, the locality indicated will become to residents of the city one of the easiest and most favourite resorts for recreative enjoyments. A proposition, suggested in one of my former Reports, that the paths along the

base of the ridges and along the Yarra banks might be widened into pleasure drives, could now be readily carried out, the Yarra flats, by recent arrangements, being no longer occupied as pasture ground.

In special artistic ornamentation as yet little has been effected, the Director deeming it of pre-eminent importance to devote his early means to the raising of trees and utilitarian plants, such as will mitigate the heat of our summer clime, and increase the salubrity of the city, or such as will play an important element hereafter in our rural economy, and originate new industries. This is the reason why no fountains exist, save one in the central island of the lake; thus neither are statues erected.

Works of art we can call forth at pleasure, while time lost in forming the plantations cannot be regained. Now, however, since the main planting operations have been effected, it is but too desirable that a few appropriate statues and monumental works should add to the embellishment of the very varied vegetation, and stand with it in bold or beautifying contrast. It is proposed to gather works of art, constructed of the most varied material; the Carrara marble, all the cement compositions, the various blendings of ore, might all be brought together for illustration. For the play of fountains, the water pressure was hitherto quite insufficient, inasmuch as the Yan Yean works are only utilized when, at late night-hours, the pressure exceeds 40 lbs. to the square inch. Had not, providently, each of the many garden buildings been supplied with a spacious cistern, it would have been impossible to save the plantations from destruction during the trials of the summer months, unless by costly means Yarra water had been forced to the culmination of the hill for extensive irrigation. A special vote, adequate for such waterworks, has never been at my disposal, nor could such independent water-supply have been maintained, unless annually a considerable outlay for fuel and attendance to an engine were incurred, or, what appears still less desirable, a windmill—apt to interfere with the traffic, and never sightly—had been established on the summit of the ridge. Nevertheless, it might be highly instructive to show, by local experiment, how much Yarra water could be forced by steam-power to the summits of our rises, within certain expenditure of capital and labour, because the fertility of many extensive tracts of the country could be very much increased, and the clime vastly be ameliorated, if rivers like the Yarra, and still more so those of the

great Murray system, were not allowed to flow unutilized into the ocean.

Waterholes are sunk into tenacious clay soil on the higher-lying parts of the ridge, for securing the storage of Yan Yean water during rainy nights; and from these reservoirs the water is led readily during the hottest weather, by gravitation, to the plantations on the slopes below.

The abandoned quarries have been decorated with Agaves, Aloes, Mesembryanthema, some Pelargonia, and other rock-plants; while Brambles, Strawberries, and other wild fruit-plants, attractive to children, have been planted in the gullies. Goodenias, Roses, and other shrubs line the river and lagoons. The Fern-tree gulley has been extended, and to the various hardy arborescent Ferns, some perhaps a century old, huge square Todeas of great age, Staghorn Ferns, and very many other species, were added in masses. The kinds of hedges now shown in different parts of the ground are very various, but that of *Pittosporum eugenioides*, first adopted by myself, is most admired, and called forth an extensive trade in this plant. Four other New Zealand Pittospora, as well as our native *P. undulatum*, are among those chosen for hedges. The Chamomile edgings, as time absorbing as defertilizing, and apt to be trodden down, are being gradually abolished. Turkish Box, dwarf Roses, *Veronica decussata*, Rosemary, and most particularly *Mesembryanthemum tegens*, are substituted. The latter plant can be obtained largely from the Yarra flat, never fails in the heat of summer, and grows so depressed as to need only lateral trimming. Although large improvements have taken place on all the lawns, they still require gradually to be turfed with *Cynodon dactylon*, a grass which is within a few weeks established, by casting its rhizomes, converted into small pieces, over the broken and levelled ground,—a process extensively adopted by the director of the Sydney Botanical Garden; it tends also much to subdue weeds. On the even surfaces of ground clothed with Cynodon, an ever-verdant fine turf can be maintained by the ready appliance of lawn-cutters and rollers. Banded flower-masses might be interwoven; but as yet such works of luxury, for which, after the lapse of the season, no permanent return can be shown, have not been attempted in this young establishment. There is, nevertheless, a gay display of flowers in the special garden-land through the greater part of the year; indeed, the variety is far greater

than a superficial observer will imagine, inasmuch as the area variedly studded with flowers is so extremely extensive.

The incessant calls, however, to provide for public *fêtes*, tea-meetings, and bazaars, decorative flowers, not rarely deprive the garden of a real show of ornament. The plants throughout the ground are very extensively labelled, about 3000 iron labels being employed. Labels, however, with fused, and thus unobliterable letters, are here, as elsewhere, yet a great desideratum. In the large conservatory all plants are placed, for instruction's sake, along both sides of the stages, so as to represent those of the Western and of the Eastern hemisphere separately, the plants of the various families being again grouped together. In an inexpensive structure, far too modest to do justice to so grand a plant, the Royal Water-lily has flowered throughout two seasons, and repeatedly has ripened seeds, available for transmission to the hotter parts of Australia. The high temperature of the Victoria House is inexpensively provided by its connection with one of the forcing-pits, while, in the humid heat, Vanilla and many other epiphytal Orchids of the jungles of the torrid zone find here the conditions necessary for their permanent existence. The standard collection of Vines and orchard trees has annually been added to. Fruit from these has been supplied to public charities. The experimental ground has also annually grown richer. To attempt to specify the treasures of the Garden, whether utilitarian or ornamental (many first introduced by the Director into Australia), is beyond the scope of these pages. The special catalogue appended to this document will exhibit many which we possess, but not all, inasmuch as thousands of plants occur yet in too young a state to correct their erroneous appellations. Mere varieties and garden hybrids, as a general rule, have been excluded from the catalogue. In a full account of the botanical establishment, submitted by order of the Government to His Royal Highness the Duke of Edinburgh, I specially alluded to some of the leading useful or remarkable plants. But an explanatory enumeration of all would enlarge to a volume, or might find space in a contemplated publication, which would serve as a garden guide. To add still further to this valuable collection, Mr. Heyne proceeded, at my request, early this year to Sydney, to select from the local conservatories. In this object he was very liberally supported by Mr. C. Moore. The suppression of the two principal kinds of Mistletoe (*Loranthus pendulus* and *L. celastroides*), which, on neg-

lected ground, often manifest themselves by the widely visible dead ramifications of the trees, causes here much loss of labour. The annihilation of the trophy guns throughout Britain suggests the propriety of removing those which occupied for some years a position in this Garden. The spot allotted to them might far more pleasingly be occupied by a small ornamental building, in which the native birds, which, permanently or migratively, are inmates of the Garden area (approximately 140 species), could be illustrated by single museum specimens, to satisfy constant inquiry in reference to the scientific names of the species. The lake is often swarming with water-birds, the tame swans, pelicans, ducks, etc., acting as decoy birds. Thrushes teem in the shrubberies. To the aviary, donations of parrots, cockatoos, and other showy native birds, not formerly kept, would add much interest. The formation of an outdoor fresh-water tank, for the culture of hardy aquatics, which in the lake generally succumb under the prey of water-birds, is highly recommendable. The introduction and multiplication of important plants, of industrial or medicinal value, has received careful attention. Thus about 10,000 young Peru bark plants have been raised, comprising mainly *Cinchona succirubra*, *C. Calisaya*, and *C. officinalis*, the latter, the most hardy of all, predominating.

These plants have withstood the night frosts, which we experience near Melbourne, when merely placed in brush shades. On one occasion the thermometer in these shades sank to 28° F., while in the open ground it stood at 24° F. near the surface; still the plants suffered no further than getting some of the leaves and youngest branches injured, but soon formed new leaf-buds. These frosts affect, moreover, also some of the plants which inhabit the mild sheltered glens of our ranges, and I am therefore justified in anticipating that, in many of the warmer forest regions of Victoria, the *Cinchonæ* could be grown to advantage, these plants being consociated with Fern-trees in their native haunts in the middle regions of the Andes. Coffee plants scarcely suffered in the brush shades, in which the temperature may be regarded almost analogous to that of our Fern-tree gullies. It would be very important to ascertain, by actual test in the ranges, whether the Coffee and *Cinchonæ* would yield prolifically. In such localities, under any circumstances, the Tea-shrub would so luxuriate as to produce an abundant crop of leaves, since even in dry localities of the Botanic Garden, and in its poor soil, the Tea-bushes have grown quite

well. Cork-Oaks, of which, as of Tea, several thousand plants are reared, would also produce far more rapidly their useful bark in the ranges than near the city; there the American Hickories and Walnuts, of which a copious supply of seedlings exist, would grow much faster. These, with the Red Cedar, West Australian Mahogany, Sumach, Scotino, Dates, Carob-trees, Valonia, and Dye-Oaks, Mastix-trees, Arrowroot, and perhaps also Tapioca, Tamarinds, and very many other prominently utilitarian plants, would thrive best in the rich humid soil of our mountains, and might occupy localities not readily eligible for cereals.

Observations in reference to the effect of night-frosts on the principal plants, as well as records concerning the flowering-time of various species, are registered in the office. Notes are also accumulating respecting the adaptability of the dry desert tracts, and again of the alpine highlands, to certain cultures. By a Parliamentary return submitted last year, it was shown that from 1859 till July 8, 1867, not less than 355,218 plants were distributed to the public reserves, cemeteries, church and school grounds of Victoria. During 1868, again, 49,475 plants were rendered available for this purpose. These distributions comprised very many of the rarest Pines and other select plants, often not otherwise available, many requiring two years' attention in the nurseries here, thus involving the necessity of maintaining, during some years, approximately, 40,000 plants alone under pot culture. Bearing in mind the increasing extent of trading establishments, exceedingly well conducted, it is worthy of the consideration of the Government whether these distributions from a public establishment should not be materially decreased, or abolished altogether. Numerous plantations, by the impetus given, are now established on public grounds throughout the colony, from whence, moreover, seeds and cuttings might be locally obtained. Eminently useful plants of many kinds have, for local experiments, been widely scattered over the country. The Treasury Reserve received last year 245 to some extent already upgrown coniferous trees.

Turning to the special phytographic department, it may be observed that the Museum now contains about 350,000 prepared and arranged plants; the Australian portion being richer than that of any kindred institution in existence.

The sixth volume of the 'Fragmenta Phytographiæ Australiæ,' a

work devoted to original discoveries, and written in a language common to science of all nations, is almost completed. The fourth volume of the universal work on the plants of Australia is, through my aid, under the rare advantages attainable in the great national institution of Kew, just completed by the President of the Linnean Society, and comprises the Orders of *Corolliflorœ.* Extensive preliminary researches have been carried on already for the fifth, sixth, and seventh volumes; to which, finally, a supplement is to be added. To promote, by further field researches, the objects of this large work, on which all subsequent medical, technological, and rural observations in reference to the native Australian vegetation must rest, I visited, during the past spring, one of the most important tracts of West Australia. Finally, also, the great task yet remains to be performed of tracing out more completely the relation of geology to the distribution of the plants existing as well as passed away,—a line of researches for which excellent geographical and geological maps are annually affording more facilities. Mr. Dallachy continues sedulously to collect, both for the Garden and the Phytographic Museum, in the north-east part of Queensland.

The following are the genera which, since the issue of my last Report, by local independent researches, have been added to the system of Australian plants:—*Dillenia*, *Cakile*, *Aldrovanda*, *Gomphandra*, *Connarus*, *Strongylodon*, *Salacia*, *Caryospermum*, *Casearia*, *Cucurbita*, *Œnanthe*, *Antirrhœa*, *Lasianthus*, *Ophiorrhiza*, *Geophila*, *Aniseia*, *Erycibe*, *Ichnocarpus*, *Ceropegia*, *Bassia*, *Chrysophyllum*, *Thunbergia*, *Graptophyllum*, *Dischisma*, *Cylicodaphne*, *Cinnamomum*, *Plecospermum*, *Taxotrophis*, *Hyrtanandra*, *Nepenthes*, *Apostasia*, *Cirropetalum*, *Pogonia*, *Spathoglottis*, *Dracœna*, *Bambusa*, *Centotheca*, *Angiopteris*, *Marattia*, *Deparia*, *Isoetes*; and the following genera new to phytography:—*Fitzgeraldia*, *Pagetia*, *Davidsonia*, *Thespidium*, *Eleutheranthes*, *Thozetia*, *Carnarvonia*, *Darlingia*, *Helmholtzia*, *Corynotheca*; by which means representatives of *Connareœ*, *Samydeœ*, *Selagineœ*, *Nepentheœ*, and *Apostasiaceœ* are added to the Australian flora. The following are additions to the list of Australian trees published in the volume of the Intercolonial Exhibition:—*Melodorum Maccraei*, *Pittosporum rubiginosum*, *P. venulosum*, *Eriostemon squameus*, *Sterculia laurifolia*, *Sloanea Woollsii*, *S. Macbridei*, *Gomphandra Australiana*, *Leucocarpon celastroides*, *Taxitrophis rectinervis*, *Ficus Benjaminea*, *Croton triacros*, *Beyera viscosa*,

Mallotus polyadenos, M. Dallachyi, M. repandus, M. Chinensis, M. pycnostachys, Macaranga involucrata, Oxylobium Callistachys, Pithecolobium Sutherlandi, Archidendron Lucyi, Quintinia Fawkneri, Cuttsia viburnea, Hakea macrocarpa, Carnarvonia aralifolia, Dryandra floribunda, Myrsine achradifolia, Bassia galactodendron, Chrysophyllum pruniferum, C. myrsinodendron, Alstonia verticillosa, A. villosa, A. excelsa, Cerbera Odollam, Casuarina Fraseriana.

In the event of its proving inadvisable to devote the New Exhibition building to the intended collections of a general industrial museum, it might be advisable to enlarge the Phytological Museum building in the Garden, in order that a full display of vegetable objects of industrial interest may be formed. The absolute want both of space and accommodation frustrated every attempt to render my establishment also useful in this direction.

During the Intercolonial Exhibition an apt opportunity arose to represent more fully the technological value of many native vegetable products, and for this purpose, from the ordinary resources of the establishment a laboratory was constructed. I need not detail the experiments conducted in reference to the value and percentage of many kinds of paper material, essential oils, dye stuffs, wood vinegar, tar, wood spirits, and tannic acid, from native plants, especially trees; on all of which ample information was offered in the documents concerning the Exhibition. These phyto-chemical observations have since been continued as far as circumstances permitted.

Appended to this Report are the tables of very extensive series of analyses, conducted in detail by Mr. Chr. Hoffmann, in reference to the yield of potash in our more gregarious native trees. They show that the manufacture of this alkali can be pursued here more profitably than in those countries in which the supply of original timber is far less extensive than in Victoria. The examination into the yield of iodine and bromine in our seaweeds is commenced; likewise, the yield of soda in one of the principal littoral plants is recorded. I have entered also on a series of toxicological researches, by which it is hoped the nature of those poison plants so injurious to stock will be fully elucidated.

A supplementary catalogue of the library is also given; many of these works, however, had to be provided by the Director's private means.

It yet remains for me to record my sense of obligation to the very numerous donors, who enriched the various branches of the establishment during a more recent period. A glance at the list of these supporters will also be the most convincing proof of the wide external communications of the department, while a reference to the plan annexed will at once largely explain the extent of the internal operations, which are singularly multifarious. It would be unjust were I not specially to allude to the graceful concession continued by the Peninsular and Oriental Steam Navigation Company, the owners of the 'Great Britain,' and many other mercantile and seafaring gentlemen, to convey, freight free, the consignments of this establishment, or were I to pass over silently the kind aid rendered by his Excellency Sir Henry Barkly, in effecting from Mauritius the final transits to Bourbon and various parts of South Africa. The foreign communications involve the necessity of correspondence in several languages, the number of all letters issued being about 3000 a year. The permanent property in buildings, iron fences, drains, boulders, waterworks, collections, library, and lasting improvements, irrespective of the plants distributed, and irrespective of the value of the local plantations, fell not short of £27,000, according to an estimate made two years ago by professional gentlemen not connected with the department. This lasting property has increased, by additions since, considerably in value. In this estimate, however, the value of the iron bridge is not included. While aiming, as far as is in his power, at the utmost economy, the Director hopes that those means which Parliament may also in future be pleased to entrust to him will proportionately enhance the lasting value of the establishment, and always bear, in scientific information afforded, and in practical services rendered, an ample return.

I am, etc.,

FERD. VON MUELLER, M.D., F.R.S.

SUPPLEMENTARY REPORT.

In accordance with your instructions, I have the honour of submitting a brief Report on the work carried on in the Botanic Garden, and the scientific establishments connected therewith, during the last six months. This document may be considered as supplementary to the last general Report, and will also briefly explain what additional work seems recommendable during the year 1869.

In the horticultural division of the establishment, the shelter accommodation for tender or young plants has been extended so much, that now the whole space under cover, either by glass or calico or brush shades, exceeds half an acre. Many rare plants, often new to Australian cultivation, flowered or bore fruit for the first time. To show how the riches of the establishment are thus yearly increasing and may extensively be diffused, I may instance that the first Flame-tree, in producing fruit last year, gave the means of raising nearly one thousand seedlings. The Grevillea avenues commenced flowering this season, and it may be imagined what a brilliant effect the long lines of this tree will produce in years to come.

The conservatories have been rendered lately still more gay by new access to the silvery and banded Assam Begonias, the variedly spotted Caladiums of Central America, and various Gesneriaceous and many other gorgeous plants; while arrangements are made to add to the collection Dionæa, the Sarracenias of North America, Biophytum, and other plants, remarkable for spontaneous movement or extraordinary structure. The Great Central American Water-lily bearing the name of her Majesty is now flowering through the third year; but the narrow, inexpensive house, allotted as well to this noble plant and other tropical aquatics as to the equinoctial *Orchideæ*, stands much in need of extension. To the plants in the general garden ground additions have steadily been made, so much so, that now a fair rearrangement can be effected in many places, to represent on separate plots the characteristic vegetation of the great divisions of the globe in a very instructive manner. During the extraordinary dryness of this summer miles of edgings became quite parched, and will require renewal in the autumn, for which purpose the less perishable Mesembryanthemum will be chosen. Porcelain labels, with unobliterable letters, have been ordered as a commencement of naming the plants in a more lasting and sightly manner. His Royal Highness Prince Alfred, during his stay last year, condescended to plant on one of the lawns, in remembrance of his visit, the Patagonian *Saxono-Gothæa conspicua* and the Californian *Pinus Alberti*, trees which commemorate the name of his illustrious and lamented parent.

A great boon has been conferred on the Garden by the Government, in sanctioning the establishment of steam-works for forcing Yarra water to the highest rise, 110 feet, whence some irrigation is now effected

over the greater part of the Garden area and the adjoining reserves. If even during ordinary summers the duty of providing for the safety of the extensive plantations proved a source of very great anxiety, and of extreme toil, both day and night, then this duty became still more onerous during the horrors of an almost rainless summer, when, during successive hot winds, the up-growing tree-vegetation, as well as the tender garden plants, had to be protected over nearly 400 acres of ground against the imminent danger of destruction, and this with an inadequate water supply. Happily this difficulty, in a great measure, has now been overcome.

The expenditure for the raised Yarra water exceeds slightly 4*d.* per 1000 gallons.

New South Wales house coal, screened, per ton of 2240 lbs., as under contract for 1869, £1. 6*s.*

The capacity of the small temporary tank to receive the water at the summit of the ridge is, however, only 1700 gallons, and until provision shall have been made for a spacious and raised tank, as intended, one great difficulty will continue, namely, that although a large supply of water is available, it can, under faint pressure, only in very limited quantity find its way through the ramifications of the former Yan Yean pipes to distant higher parts of the Garden and reserves.

The eight mostly spacious cisterns for the reception of rain-water from the roofs of the Garden buildings, and the four iron tanks, will be kept filled, to provide against any emergency in the event of breakage at the engine. I may still remark that, although during the cooler months steam-power will not require to be used every day, nevertheless, any savings then effected in the outlay will need to be expended again during the hottest weather, when fourteen hours' daily work of the engine will be needed.

The Geyser fountain in the lake (which for two afternoon hours in cool weather, and then on Sundays only, was worked with Yan Yean pressure) has ceased to play. Until the steam-engine was provided the Garden enjoyed Yan Yean supply during two night hours (from 3–5 A.M.), provided in cool weather the pressure admitted of obtaining any supply at all; but this boon has now entirely ceased. The whole of the former Yan Yean pipes, provided at the expense of the Garden, have become available again for the conveyance of the Yarra water.

The large reserve between the St. Kilda Road and the Yarra is con-

verted, within the last five years, from a treeless waste into an incipient forest. From year to year additional kinds of trees become interspersed; thus shade and shelter as well against the north-western desert winds, as also against the south-west antarctic storms, will be more and more obtained. Few even of our metropolitans seem aware that the verdant valleys which, within five minutes' drive from the City Bridge, slope gently to the Yarra, afford already charming picnic grounds, on which, free from the dangerous vicinity of the reptiles of our ranges, field amusements can be enjoyed simultaneously with views of rare beauty. Access of carriages to the whole of this rising ground and its gullies is permitted, under the anticipation that all ordinary caution will be exercised to prevent injury to the young trees. By the gradually denser growth of Grass, Lucerne, and Clover plants, the so-called Cape-weed (*Cryptostemma calendulaceum*) has become largely suppressed; but inasmuch as the Director of the grounds has repeatedly been accused of having brought this and other weeds, as well as some winged invaders, into our colony, it may be right to place it here on record, that the whole of these assertions is contrary to facts, and that already, in 1833, Baron Von Huegel noticed and recorded the *Cryptostemma* as an inexterminable weed of Australia. A gardener's cottage has occupied, for some months, the last of the empty old quarries, until then a favourite retreat of vagrants.

For more than a mile's length, basalt boulders have recently been brought from Jolimont, by permission of the City Council, to line the intended footpaths on both sides of the main drive. The drive itself, to the width of twenty feet, requires to be macadamized, for which purpose the boulders may be utilized, whenever more elegant linings can be substituted for them.

By the friendly aid of the military authorities lately, walks have been laid out on and near the Yarra bank, towards the City Bridge. During the coming autumn it is intended to define these walks with many hundreds of rose-bushes. The fences along the St. Kilda Road, Domain Road, and Anderson Street, up to the point at which the iron fencings commence, have sunk almost into destruction. Several thousand young Willows, planted along both sides of the Yarra bank during the last cool season, have weathered fairly through this summer of drought, labour for watering those on the north bank having been granted by the Corporation.

An important work will devolve on the department in further excavations on the lake, if the needful extra aid can be rendered. The water has entirely evaporated through the aridity of the season, and no sufficient rise of the river has taken place to refill the lake. The advantages of deepening this basin would be manifold. Its niveau and that of the river would become permanently equal, and a constant communication between both would become possible; material would be gained to heighten the flood-dam so far as to obviate future inundations of the Garden; the brackish water of the lake would become fresh and available for garden purposes; further storage of soil for the improvement of the meagre Garden slopes would become possible; waterfowl might permanently be maintained on the lake; and finally the aspect of the whole landscape would be greatly beautified.

Sir William Macarthur's method of wrapping hard seeds in moistened cloth to speed their germination has been adopted to advantage.

A variety of Bamboos and different Sugar-canes were secured, including the hardy Chinese cane; forty-eight kinds of Vines were added on behalf of the Acclimatization Society to the already large collection, which includes the white and black American Scuppernong, the Sultana raisin grape, the French Cognac grape, Follet Blanche, and many other famed kinds, new or rare in Australia. The true Oriental Dye Saffron, Colchicum, the oil-yielding Sesamum, the Tussac-grass of the Falkland Islands, the Caper (quite an ornamental plant), the wide-spreading avenue Acacia of West Australia (*Acacia saligna*), *Ficus Sycamorus* (the best of all avenue trees of the Orient), the Clove, *Rhamnus utilis* (yielding the green satin dye of China), the Sapodilla, the Avocado Pear, the Indian Teak, Cassava, Squill, Turmeric, the medicinal Bhel fruit, the Tree Cotton, Mangosteen, edible Vanguiera, Aya-pana, Gelsemium, and many other important plants, are more recent acquisitions to the Garden. Although it may as yet be impossible to cultivate remuneratively the Saffron and many other of the plants indicated, it remains evidently still the aim of a public institution to establish such plants timely in the country.

Turning to the nursery department, I can report favourable progress, notwithstanding the precarious supply of water during the great heat. For the first time in Australia masses were raised of plants of Assam Tea (the seed kindly supplied, at the Director's request, by W. H. Birchall, Esq.); so also large numbers of the White-heart Hickory or

Mocker-nut (*Carya tomentosa*), of the delicious Pecan-nut (*Carya oliviformis*), the Butter-nut (*Juglans cinerea*), the Black Walnut (*J. nigra*), the Himalayan Oak (*Quercus incana*), the Chestnut Oak (*Q. Castanea*), the American Swamp Oak (*Q. Prinos*), the Bur Oak (*Q. macrocarpa*), the White Oak (*Q. alba*, a most valuable timber tree), the Jersey Pine (*Pinus inops*), the American Pitch Fir (*P. rigida*), the Douglass Pine, the noble Himalayan *P. longifolia*, the Chinese Fir, the Balm of Gilead Fir (*P. balsamea*), the double Canada Balsam Fir (*P. Fraseri*), the West India Pencil Cedar (*Juniperus Bermudiana*), and the American Cherry Birch (*Betula lenta*).

Many other highly valuable trees have been lately introduced, but not really in masses. Secured were, however, large supplies of the seeds of *Pinus Gerardiana* (the Tibet Ree or Shungtee), which furnishes sweet edible nuts for Indian and Persian bazaars; and grains also were obtained in quantity of *Juniperus religiosa* (the Himalayan Pencil Cedar). Many good-sized plants of the latter have been several years on our lawns. Nearly all the tree seeds from the United States, were obtained through the generous aid of Professor Asa Gray, of Boston.

Perhaps the most remarkable of all plants lately brought under cultivation is the deadly poisonous *Physostigma venenosum*, the Calabar Ordeal Bean, a plant of the utmost importance in ophthalmic diseases. The large hard bean was buried fully four years in soil before it germinated.

As decennia roll on, many of the trees, which under great efforts are now introduced, will undoubtedly bear prominence in our forest culture, —a great subject, which more and more presses on legislative attention, since already so much of the native timber in all the lowlands has been consigned to destruction. If, in densely-populated countries like Belgium, one-fifth of the whole of its territory is scrupulously kept under forest culture, it ought to be a final aim, in a far hotter clime, to maintain a still greater proportion of its area covered by woods, if the comforts and multifarious wants of a dense population are to be timely provided for. It is especially in the western and northern parts of Victoria where exertions in this direction have to be made; it is there where extensive shelter and retention of humidity is needed, and there also where artesian borings on spots, indicative as eligible, would vastly promote the raising of forests.

By your kind concession, Sir, I was enabled to spend in the beginning of this year one week in Tasmania, with a view of adding, by field observations and new collections, to the material of my works. This journey (my first to the island) was to me replete with interest. For although I had aided in the elucidation of the Tasmanian vegetation for more than twenty years from museum plants, I had no opportunity until this year to observe the many highland plants, absolutely peculiar to the island, in their wild native grace. Moreover, I succeeded, within the brief time of my visit, in ascending Mount Field East, about 5000 feet high, lying about halfway between Hobarton and Macquarrie Harbour; and as this mountain range and the shores of Lake Fenton had not been subjected to any previous phytological investigation, it fell to my share to obtain copious novel information on the distribution of the alpine plants of Tasmania. To contrast the consociations of these and their geological relations with those of the Australian Alps proved in a high degree instructive.

The Museum collections become more and more important, and their value as a lasting source of authentic information for centuries to come can never be over-estimated. It remains, however, a source of regret that no more amateur collectors in far inland localities send spontaneously plants, simply pressed and dried; by which means much would be learnt additionally on the range of different species over the continent, and their variation in form. The facilities for obtaining reliable information on any plants, always cheerfully given, might in the future also not be equally great, nor the opportunities of literary record always remain the same. If to the several hundred thousand plants in the Museum still a collection could be added, rich in authentic specimens, described in works during the earlier parts of this century, we would then possess one of the grandest institutions for phytographic research anywhere in existence.

The want of an appropriate hall, with proper fittings, has prevented special teaching by lectures in the Garden. But, as an illustrious Professor of Natural Sciences also teaches phytology at the University, it might be desirable to restrict any future occasional demonstrative lectures in this place to those industrial phytological subjects, through which science enters into the occupations of daily practical life, occupations of which many in this young country have still to be called forth. It might be desirable, also, with a view of diffusing a vivid knowledge

on the native vegetation, to arrange for occasional Saturday afternoon excursions of students and amateurs to botanically-interesting spots in the vicinity of the city.

Whatever may be the decision in reference to the organization of the general Industrial Museum in the city, there should certainly be spacious room in the Garden available as a store for objects of leading plants of different parts of the globe. Such vegetable objects, like those in Sir William Hooker's great institution of Kew, could not be more advantageously studied than in connection with the living plants of the Garden or conservatories.

The timber, fibres, resins, gums, dyes, paper materials, drugs, oils, alkalies, and many chemical educts from plants of Australia could be contrasted with similar products of other countries; the processes of manufacture and their technological and commercial value be demonstrated; while subjects relating to culture of any kind could be elucidated, diseases of plants by objects and drawings illustrated, and many other kindred inquiries drawn into vitality of practical application. Thus I may instance that it seems not generally known how our common *Eucalyptus* leaves, under Ramel's process, can be converted into cigars, or how the same leaves serve as a remedy in intermittent fever.

I herewith beg to submit the fourth volume of the work on all Australian plants, elaborated, under my aid, by the President of the Linnean Society. This volume brings the number of species already described to nearly 5000. For the fifth volume, which is to embrace mainly the *Monochlamydeæ*, the whole material in our Museum has been preliminarily prepared. Hitherto, precisely fifty large cases of museum plants, in 922 large fascicles, with notes, have been transmitted on loan to Kew for the elaboration of this work, the collections here accumulated, or furnished originally from hence, being more extensive than the united former Herbaria of Australian plants in Britain.

We may reflect, not without pride, on the fact, that a similar descriptive work exists not even yet for the vegetation of Europe, and we may also remember that, without a work of this kind, the confused vernacular appellations, and any medicinal, technological, cultural, or other observations on the native plants, could not be reduced to a solid scientific basis. R. Brown's celebrated 'Prodromus,' issued in 1810, comprised only about one-third of the Australian plants then known, and even the Orders elaborated in his volume have been augmented by

more recent researches almost threefold. Of the 'Fragmenta Phytographiæ Australiæ,' the sixth volume has also been completed last year, and the seventh is commenced. Within the few next years I trust it will be in my power, if Providence grants me life and strength, to issue, on the plants of each of the Australian colonies, a special volume, for which much preliminary work has been done.

The library became also lately further enlarged, but mainly on the Director's private means. Personal travelling expenses since 1852, and all outlay for scientific and local journals, British and foreign agencies, means of conveyance for attending at the city, office light, and many other official expenses, as well as the courtesies which are demanded from a public department frequented by very numerous visitors, have also ever solely and readily been defrayed from the administrator's own resources, who, not for any selfish purposes whatever, ventures to place these facts, after the lapse of many years, on record, but simply in justice to himself, because the obligations devolving on him in maintaining the efficiency and dignity of the department seem not at all understood.

When now long past the zenith of ordinary life, he can with fairness assert, that thirty of his best years have been absorbed almost entirely in phytologic and cognate pursuits; that almost seventeen years have been devoted cheerfully and exclusively to the main foundation and on struggling services of his department, and this, he may add, with the sole aim of endeavouring to effect some lasting good to the great country which, since twenty-two years, he adopted as his permanent home.

FERDINAND VON MUELLER.

REVISION OF THE GENUS SANGUISORBA.

By Professor Alexander Braun and C. Bouché, Esq.

(*From Index Sem. Hort. Bot. Berol.* 1868.)

Sanguisorba, Tabernæm.; J. Bauh. (1651); Scopoli (1760); Wiggers (1780); Spenner et Schimper (1829); Moretti (1833); Cesati (1841). *Pimpinella*, C. Bauh. (1623); Tournef. (1719); Haller (1742); Gærtner (1788). *Poterium*, Benth. et Hooker, Gen. Pl. (1865).

Subgen. I. SANGUISORBA, *L.*—Flores omnes hermaphroditi (rarius polygami, supremis mere femineis), aut omnes tetrandri, aut omnes dodecandri, plerumque monogyni. Stigma muricato-papillosum. Calycis tubus fructifer siccus, quadrangularis vel quadrialatus, lævis. Vegetatio in omnibus lateralis, surculis floriferis e foliorum radicalium axillis prodeuntibus.

Sect. 1. EUSANGUISORBA, De Cesati, Iconogr. Pl. It. ii.—Stamina 4, carpidium 1, calyx fructiferus quadrangularis vel anguste quadrialatus.

A. *Florescentia adscendens* (*centripeta*).

1. *S. Canadensis*, L., cum varietate *Sitchensi* (*latifolia*), et (?) *S. media*, L.

2. *S. alpina*, Bunge.

B. *Florescentia descendens* (*centrifuga*).

3. *S. officinalis*, L. (cujus varietates esse videntur: *S. montana* et *serotina*, Jordan, nec non *S. auriculata*, Scop., cui flores polygami adscribuntur).

4. *S. tenuifolia*, Fisch., cum formis affinibus non satis extricatis: *S. carnea*, Fisch.; *S. rubra*, Schrank; *S. angustifolia*, Fisch.; *S. longifolia*, Bertol.

5. *S. polygama*, Nyland. (An a *S. officinali* satis distincta?)

Sect. 2. PTERACHENIUM, De Cesati, l. c.—Stamina 6–15 (sæpissime 10–12); carpidia 1–2; calycis tubus latissime alatus; florescentia e regione media adscendens simul et descendens.

6. *S. dodecandra*, Moretti.

Subgen. II. POTERIDIUM, *Spach.*—Flores omnes hermaphroditi, diandri vel tetrandri, monogyni. Stigma breviter penicillatum. Calycis tubus fructifer induratus, quadrialatus, reticulatim et transverse rugosus. Vegetatio terminalis. Florescentia adscendens.

7. *S. myriophylla* (Rchb. Herb.), A. Br. et Bouché.

"*Poterium myriophyllum*, Gay, 309," Select. Sem. Hort. Acad. Dresdensis, 1846. ("Gay" errore typographico pro Geyer.) "*Poterium myriophyllum*, Reichenb. (N. Am. Geyer) Hort. Dresd. 1846; Reichenb. pater in herb. filii. *Poterium annuum*, Nutt. msp. in Hooker, Flor. Bor.-Amer. i. (1140), p. 198. *Sanguisorba annua*, Nutt. msp. in Torr. et Gray, Flor. of North Am. i. 429; Hooker, London Journ. of Bot. vi. (1847) 219; Torrey in Marcy, Exploration of the Red

River of Louisiana, 1853, p. 280, t. v. *Poteridium annuum*, Spach in Ann. Sc. Nat. 3 sér. tom. v. p. 43. *Sanguisorba occidentalis*, Nutt. msp. sec. Torr. et Gr.

Herba secundo anno florens, gemmis in axillis foliorum radicalium ortis perennans, vegetatione terminali i. e. axi primaria in surculum floriferum excrescente. Surculus e basi rosulam foliorum radicalium gerente progrediens erectus, multifolius, ramosus, ramis axi primaria brevioribus. Folia glabra (in planta juvenili ad rachin parcissime pilosa), pallide viridia, subglaucescentia, ætate pallide rufescentia vel luteo-fuscescentia, radicalia et caulina imparipinnata, 5–7-juga, foliolis pectinato-pinnatipartitis (in planta juvenili pinnatifidis), segmentis utrinque 3–7 (posterioribus anteriora numero superantibus) linearibus acutiusculus. Stipulæ adnatæ, in foliis radicalibus vaginam elongatam integram, utrinque dente inconspicuo terminatam, in foliis caulinis brevem bilobam, lobis recurvato-patulis margine superiore (more foliolorum) pectinato-partitis, formantes. Spicæ densifloræ (in surculo primario et ramis majoribus) oblongæ, cylindricæ vel (in ramis et ramulis minoribus) capituliformes, globosæ. Florescentia adscendens, floribus infimis nonnunquam tardivis. Flores omnes hermaphroditi, albo-virescentes. Bracteæ flore paullo breviores, occultæ, latissime ovatæ, obtusæ, concavæ et subcarinatæ, basi utrinque paullulum accurrentes, bracteolas et tubum calycis amplectentes, scariosæ, albohyalinæ, uninerves. Bracteolæ (prophylla) bracteis similes, minores, basi nervo brevissimo mox evanescente instructæ. Calycis lobi late oblongi, late albo-marginati, medio virides, obtuse apiculati, apiculo rufescente, post anthesin reflexi. Stamina constanter 2 !, lobis calycinis interioribus (lateralibus) opposita, exserta. Filamenta filiformia ; antheræ breves, luteo-albæ, subfuscescentes. Carpidium unicum, stigmate breviter penicillato albo. Tubus calycis fructifer coriaceo-induratus, sublignosus, ovatus, utrinque attenuatus, alato-quadrangularis, alis crassiusculis acutis, faciebus medio reticulatim, margine transverse rugosis, rugis alas intrantibus. (Dispositio foliorum $\frac{3}{8}$, in spicis $\frac{1}{3}\frac{2}{4}$.)

Species valde singularis, primum in horto Dresdensi culta, orta e seminibus plantæ a cl. Geyer in Oregon lectæ, cujus locus natalis a collectoris his verbis indicatur : "Loamy, stony, sunny watercourses, Spokan highlands, with *Hosackia Purshiana*. The seedling plants have tawny-coloured leaves in the winter." (No. 467.)

Sanguisorba annua, Nutt., quam dubiis quidem vexatus, tandem sine

hæsitatione cum planta supra descripta conjungimus, secundum descriptionem cl. Torrey et Gray plurimis notis optime congruit, binis autem, duratione annua et staminum numero quaternario discedit. Quod quidem ad durationem attinet, error facilis et discrepantia nullius momenti; numerus autem staminum a cl. Torrey et Gray indicatus errore adscribi non potest; confirmatur enim icone Torreyana supra laudata et cl. *Spachii* testimonio. Quam ob rem numerum staminum, in planta culta quidem constanter binarium, secundum loci natalis diversitatem mutabilem esse crediderim. Etenim habitatio *S. annuæ* ab auctoribus indicatur duplex, hinc ad flumen Red River in Arkansas et Louisiana, illinc in Oregon. Stirps orientalis et occidentalis, quamvis simillimæ, tamen non omnino convenire videntur, quod ipsius Nuttallii sententia erat, qui secundum adnotationem cl. Torrey et Gray stirpem Oregonam propter caulem minus ramosum et foliolorum segmenta acutiora specie distinctam esse censuit et *S. occidentalis* nomine salutavit. Has differentias nullius momenti esse auctoribus Floræ Bor. Amer. concedimus, sed gravior in staminum numero adesse videtur, quæ varietatis orientalis (tetrandræ) et occidentalis (diandræ) distinctionem permittere videtur.

S. myriophylla floribus *Sanguisorbæ*, stigmate et fructu *Poterii*, genera jam pridem, Scopolio duce, a pluribus auctoribus juncta novo vinculo connectit. *Sanguisorbæ* genus, latiori sensu conceptum, eximium præbet exemplum diversi in inflorescentiis ejusdem indolis evolutionis ordinis, florescentiæ nunc a basi adscendentis (centripetæ), nunc ab apice descendentis (centrifugæ), nunc e regione media sensu opposito progredientis in spicis simplicibus ad eundem typum constructis. Dispositionem specierum totius generis, fructificationis et vegetationis characteribus innixum, sequentem proposuimus.

Subgen. III. POTERIUM, *L.*, exclus. spec. nonnull.; Spach!—*Pimpinella*, Adanson. *Rytidopoterium*, (sectio *Poterii*), De Cand.—Flores polygami, superiores feminei, inferiores hermaphroditi, aut omnes polyandri, aut superiores oligandri (sæpissime tetrandri). Carpidia 2; stigmata penicilliformia. Tubus calycis fructifer lignoso-induratus, tetragonus vel quadrialatus, vario modo rugosus aut verrucosus.

Sect. 1. AGRIMONIOIDES, *Spach.*—Calyx angulis æqualibus, longitudinaliter rugosus. Vegetatio herbacea, terminalis. Florescentia adscendens!

8. *S. agrimonioides*, L. (sub *Poterio*), De Cesati, l. c.—*Pimpinella agrimonioides odorata*, Tournef. *Poterium agrimoniæfolium*, Cav.

Sect. 2. PIMPINELLOIDES, *Spach.*—Calyx angulis æqualibus, transverse rugosus, reticulatus, verrucosus, muricatus. Vegetatio herbacea terminalis.

a. *Florescentia adscendens!*

9. *S. Duriæi*, Spach (sub *Poterio*).

b. *Florescentia descendens.*

α. *Surculi multifolii, plerumque polycephali, capitulis lateralibus pedunculatis.*

10. *S. minor* (Tabern., J. Bauh.), Scop. Fl. Carn. (1760).—*S. Poterium*, Wiggers (1780). *S. pimpinella*, Schimp. et Spenn. Flor. Frib. iii. (1829). *Pimpinella Sanguisorba*, Gærtn. *Poterium Sanguisorba*, L. *P. dictyocarpum* et *muricatum*, (*platilophum* et *stenolophum*), Spach. *P. glaucescens*, Rchb. *P. Guestphalicum*, Bönnigh. *P. polygamum*, W. et Kit.—Species sequentes 11–17, huic maxime affines.

11. *S. Jauberti*, Spach (sub *Poterio*).

12. *S. eriocarpa*, Spach (s. *P.*).—*Poter. Garganicum*, Ten.

13. *S. villosa*, Sibth. et Sm. (s. *P.*).

14. *S. alveolosa*, Spach (s. *P.*).

15. *S. Magnolii*, Spach (s. *P.*).

16. *S. verrucosa*, Ehrenb., Spach (s. *P.*)

17. *S. Spachiana*, Coss. (s. *P.*).—*β.* Surculi multifolii, capitulis lateralibus plurimis sessilibus.

18. *S. lateriflora*, Coss. (s. *P.*).—*γ.* Surculi paucifolii vel aphylli (scapiformes), monocephali.

19. *S. rupicola*, Boiss. et Reut. (s. *P.*).

20. *S. multicaulis*, Boiss. et Reut. (s. *P.*).

Sect. 3. SANGUISORBOIDES, *Spach.*—Calyx angulis inæqualibus, 2 late marginatis, 2 alternis anguste marginatis, reticulatus. Vegetatio herbacea, terminalis? Florescentia?

21. *S. Fontanesii*, Spach (sub *Poterio*).—*S. Mauritanica*, Desf. (non Moris).

Sect. 4. ANCISTROIDES, *Spach.*—Calyx angulis æqualibus, grosse reticulatus. Vegetatio fruticosa, lateralis! *i. e.* ramis floriferis axillaribus. Florescentia descendens.

22. *S. ancistroides*, Desf., Spach (sub *Poterio*).

Subgen. IV. SARCOPOTERIUM, *Spach* (valore generico).—*Leiopoterium* (sectio *Poterii*) De Cand. ex p.—Flores monoici in spicis androgynis, inferiores masculi polyandri, superiores feminei digyni. Calycis

tubus fructifer globosus, lævissimus, subbaccatus. Vegetatio fruticosa, terminalis, ramis (inflorescentiis depauperatis) spinescentibus. Florescentia adscendens!

23. *S. spinosa*, L. (sub *Poterio*), Bertol., De Cesati.—*Sarcopoterium spinosum*, Spach.

Bencomia, Webb, Phytogr. Canar.; Benth. et Hook. Gen. Pl. (*Poterii* sect. *Leiopoterium*, De Cand. ex p.) omni jure a *Sanguisorba* separatur. Flores dioici: masculi calyce quadripartito absque tubo, staminibus numerosis imo calyci insertis; feminei carpidiis 2–4. Tubus calycis fructifer globosus, lævissimus, cum acheniis osseis in drupam 2–4-locularem concretus. Vegetatio arborescens. Spicæ axillares elongatæ. Florescentia adscendens.—Species 2 Canarienses: *B. caudata*, Ait. (sub *Poterio*), et *B. Moquiniana*, Webb et Berth.

Species *Sanguisorbæ*, nobis incognitæ, quoad sectionem dubiæ sunt: *S. diandra*, Wall. (an e sect. *Poteridii?*) et *Poterium Indicum*, Gardn. ex ins. Ceylon.

NEW PUBLICATIONS.

Dei Funghi Sospetti e Velenosi del Territorio Senese. Per Francesco Valenti-Serini, Dottore in Medicina, ecc. ecc. Turin: 1868. Fol.

Before Dr. Valenti-Serini had commenced writing this book on suspected and poisonous Fungi, he should at least have learned something about the genus *Agaricus;* and before he began the illustrations he might, for his own sake, have taken some lessons in rudimentary drawing. For what information can we expect from one who is totally ignorant of the subgenera of *Agaricus*, unacquainted with the colour of the spores, cannot tell a brown- or purple-spored Agaric from a white-spored one, and who ignores such genera as *Russula* and *Marasmius?* The plates, fifty-six in number, and "carefully coloured after nature," are the worst we have ever seen; they not only display an ignorance of drawing of which a school-girl would be ashamed, but the gaudy colours are daubed on with such an unsparing hand, that the drawings, if depended upon, would be sure to mislead. Few botanical subjects require such minute attention to subtile details as Fungi; but here they are so coarsely and falsely drawn, and so incorrectly coloured, as to make it difficult to believe they were taken from nature at all.

This work is published under the auspices of the Academy of Medicine of Turin; it is folio in size, and the learned author prints five and a half lines of titles after his name on the title-page (each line eight inches long); but we imagine that neither the prestige of the Academy nor the voluminous titles of the author will save the book from well-merited condemnation. Indeed, we see little use in criticizing it at all, for when the author refers to a certain species as "dangerous," and we turn to the plate only to see a totally different species represented, belonging to a wholly different section of the *Agaricini*, it will be seen that the book places itself beyond the bounds of criticism. To take an example at random: plate 44 is said to represent *Agaricus aureus*. This species comes under *Pholiota*, and the characters of *Pholiota* are brown spores, and a ring or annulus to the stem; in the figure, "carefully coloured after nature," the gills are pure white, and, of the twenty stems shown on the plate, not one has a trace of an annulus. To make the confusion worse, Dr. Valenti-Serini says it is the same with Sowerby's *A. fascicularis* (t. 285), which is a *Hypholoma*, with purple spores, and gills at first dirty yellow, then purplish-green; but the doctor's figure is probably neither one nor the other. To show how totally unfit the book is for modern students, we may add that the author does not refer to books published within the last thirty years. He is unacquainted with the 'Epicrisis' of Fries; and (although the book, with the exception of two species, treats wholly of the *Hymenomycetes*) he does not know Fries' 'Monographia Hymenomycetum;' and there are no references made to well-known modern books by Berkeley and others. The letter-press is wordy and meagre, and, as it generally refers to some other species than the one intended to be described, it is of little value. The cases of poisoning and records of experiments with Fungi would have been more valuable had names, places, and dates been given. The book has already found its way into the libraries of this country; and for such students as care to know what species the cartoons most resemble (if they resemble any), the following table may be useful. In the cases where the plates are not referred to, it remains an open question whether the species are correctly named by the author or not; in the cases where the names given are correct, they are in synonyms now quite out of date. This may be seen at once in plates 2 and 3, where varieties of *Agaricus phalloides*, Fr., are termed *Agaricus bulbosus citrinus* and

Agaricus bulbosus viridis. To some of the species, no scientific name is given (merely the popular one); and when the scientific names are given, the name of the *founder* of the species is frequently omitted. It is to be understood, therefore, that where we have omitted authors' names, we have merely followed Dr. Valenti-Serini.

Tab. 4. Fig. 1. *Amanita Vitoni.* As this Agaric is shown with brown gills, it is probably not an *Amanita.*

Tab. 4. Fig. 2. *Amanita Terrea* (*o pseud-Amanita*) has dark brown gills, and therefore, if the colouring is correct, cannot be an *Amanita.*

Tab. 5. Fig. 1. *Amanita fulva.* Fig. 2. *Amanita cinerea* = forms of *Agaricus pantherinus*, DC.

Tab. 6 et 7. *Agaricus fulvaster* and *A. plumbeus.* Probably forms of *A. Ceciliæ*, Berk. and Br. Both these varieties are common in the neighbourhood of London.

Tab. 8. *Volvaria Corticelli. Volvaria* here, like *Amanita* above, is raised to the position of a genus; the curious Agaric represented in the plate has *white* gills, not pink, as might have been expected from the name.

Tab. 9. *Agaricus virgatus* is an indifferent representation of *A. volvaceus*, Bull., or the "Stov Agaric" as we call it in England, according to Dr. Valenti-Serini.

Tab. 13. *A. perlatus.* The same species as shown on Tab. 6.

Tab. 14. *A. margaritiferus*=*A. pantherinus*, DC.

Tab. 15. *A. maculatus* (!). Totally different from *A. maculatus*, A. and S., and belonging to a different section of *Agaricus.* Probably forms of the species shown on Tab. 6 and 13.

Tab. 16. *A. verrucosus*, Bull.=*A. pantherinus*, DC.

Tab. 17. *A. Hydnocephalus.* A bad representation of *A. acutesquamosus*, Weinm.

Tab. 18. Fig. 2. *A. ulmarius* (?).—Fig. 5. *A. rimosus*, Bull. Perhaps correct.

Tab. 19. *A. lacrimabundus*, Bull. Very poor and incorrect representation.

Tab. 20. Fig. 1. *A. nanus* (?).

Tab. 21. Fig. 1. *A. Peronatus*, Bolt. A grotesque caricature of *Marasmius peronatus*, Fr.

Tab. 22. *A. mutabilis*, Schæff. May be this species, or *A. melleus*, Vahl, but is not like either.

Tab. 24. *A. sanguineus*, Bull. Some red-topped *Russula* or "Red Simpl-gilled Agaric," as the benighted English are said to call it.

Tab. 25. *Russula emetica*. *Russula* is here elevated to its proper place, it is however ignored in Tab. 24, and in all the plates of *Russulæ* following the next Tab.

Tab. 26. *R. furcata*, Pers. Dr. Valenti-Serini is right for once; he was determined that the gills of his figures should bear out the specific name.

Tab. 27. *Agaricus fœtens*, De Cand. We have never seen the common *Russula* anything like this figure, where it is shown snow-white and of great size like *Lactarius vellereus*, Fr.

Tab. 28. Fig. 1. *A. acris*, De Cand. The pileus of *Lactarius acris*, Fr., is intense umber, here it is snow-white; the sienna-coloured milk is also shown white.—Fig. 2. *A. controversus*, P. Totally unlike *Lactarius controversus*, P., the white gills are shown full-burnt sienna, and the pileus is shown perfectly white.

Tab. 29. Fig. 1. *A. necator*, Bull. A caricature of *Lactarius torminosus*, F.—Fig. 3. *A. pyrogalus*, Bull. Bad representation of *Lactarius pyrogalus*, Fr.—Fig. 4. *A. theiogalus*, Bull. = *Lactarius theiogalus* (?).—Fig. 5. *A. azonites*, Bull. Marked with strong zones (!).

Tab. 30. *A. deliciosus*, P. Highly amusing representations of this fine *Lactarius*.

Tab. 31. *A. urens*, P. As much unlike *Marasmius urens*, Fr., as the other species are unlike their originals (stem spotted with crimson-lake!).

Tab. 32. *Fungus aureus cyathiformis* (?).

Tab. 33. Figs. 1, 2, 3. *Agaricus eburneus*, Bull. Poor representations of *Hygrophori* (?).

Tab. 34. *A. tubæformis* (?).

Tab. 35. *A. olearius* (?). Exactly the same with Tab. 32.

Tab. 36. *A. ulmarius*, Bull. Bad figure.

Tab. 37. *A. stypticus*, DC. Totally unlike *Panus stypticus*, Fr.

Tab. 38. "Prataioli sospetti." Varieties of *Agaricus campestris*, L. —It is very amusing to observe that Dr. Valenti-Serini is quite unaware of the scientific name of the species shown in seven figures on this plate; the descriptions of the figures are trivial in the extreme.

Tab. 39. *Agaricus ficoides*, Bull. An absurd representation of *Hygrophorus pratensis*, Fr., or "Reddish Flied Agaric," as we are said to call it.

Tab. 40. *A. comatus,* Müll. Bad representation of *Coprinus comatus,* Fr.

Tab. 41. *A. amarus,* Bull. Bright green gills, perhaps *A. fascicularis,* Huds.

Tab. 42. *A. Psittacinus,* Schæff. The yellow and green tints point to *Hygrophorus psittacinus,* Fr., but the plate is far more like a large form of *Agaricus incanus,* Fr.

Tab. 43. *A.* "*sulphureus,*" Bull. This species has a solid stem,—here it is shown very hollow all the way up, leaving only a thin bark as in some *Coprini.*

Tab. 44. *A. aureus,* with gills *snowy white* instead of brown.

Tab. 45. *A. coccineus,* Wulf. Very unlike *Hygrophorus coccineus,* Fr., or the "changeable scarlat Agaric."

Tab. 46. "Fungo detto Ammazzamogli." Perhaps *A. rachodes,* Vitt.

Tab. 47. *Cantharellus, Merulius, Hydnum, Verpa, Clavaria.* All very unsatisfactory. *Hydnum,* absurd.

Tab. 48. Fig. 1. *Polyporus lucidus.* Bad.—Fig. 2. *P. Juglandis,* Bull.=*P. squamosus,* Fr. Absurd.—Fig. 3. *P. versicolor,* P. Absurd.

Tab. 49. *P.* "*sulphureus,*" Fries. Not quite so bad as the others.

Tab. 50. *Boletus marmoreus*=*B. satanas ?*

Tab. 51. Fig. 1. *Boletus cyanescens,* Bull. Perhaps right.—Fig. 2, 3. *B. satanas.* Ditto, but the colouring is absurd in all the figures.

Tab. 52. Fig. 1. *B. pernicosus* (?)—Fig. 2. *B. piperatus,* Bull. Right ! ! ! but we do not term it "*Papper Boletus*" in England.—Fig. 3. "*Boleto Punteruolo Malefico*" (?). This plate has not got its five figures numbered.

Tab. 53. Fig. 1. *B. chrysenteron*=*B. subtomentosus,* Bull. Neither however are in any way dangerous.—Fig. 2. *B. annulatus*=*B. luteus,* L., or the "Dingi Yellow Boletus."—Fig. 3. *B. felleus,* Bull. Right ! Fig. 4. *B. cinereus,* P. (?).

Tab. 54. Fig. 1. *B. olivaceus,* Schæff. (?). Fig. 2. *B. calopus,* P. This dingy figure is totally unlike the splendid *Boletus* it is referred to.

Tab. 55. *Phallus impudicus,* Linn. A laughable caricature, evidently drawn from memory (a very treacherous one).

Tab. 56. *Clathrus cancellatus,* L. Almost as bad as the last.

CORRESPONDENCE.

Death of Dr. Meller.

I beg to send you a brief account of the death of Dr. Meller (Director of the Botanical Gardens at the Mauritius), so that you may give a compiled notice in the 'Journal of Botany,' if you think it will be proper.

Dr. Charles James Meller (M.D., and Member of the Royal College of Surgeons of England, 1857), died at Allington House, Berrima, New South Wales, on the 26th of February, 1869, aged thirty-three years. He died from general debility, the result of frequent attacks of fever, first contracted when in Africa with Dr. Livingstone, and also in Madagascar. He arrived in December at Sydney from the Mauritius *viâ* Melbourne, having been sent by the Government of that island to collect different varieties of the Sugar-Cane, and was proceeding to Queensland, and also to some of the Pacific Islands, etc., for the furtherance of that object. He visited Queensland, unfortunately at the hottest season of the year, and after collecting and forwarding a large quantity of Sugar-Canes to the Mauritius (*viâ* Sydney), he was taken ill with a renewal of his old fever, and with some difficulty was moved to Sydney, where he arrived in a seriously debilitated state. I was requested to see him, and regularly attended to him during his stay in Sydney. The season being sultry, it was thought advisable to remove him to a cooler part of the country, an arrangement in which he also concurred ; Berrima was fixed upon, having a cool mountain air, rather more than 2000 feet above the level of the sea, and distant 83 miles from Sydney, and, moreover, easily reached by railroad,—a great advantage to an invalid. He did not, however, derive the expected benefit from the change ; although the evenings were so cold as to require a fire, his appetite did not at all improve, and consequently the debility increased ; he gradually sank and died, on the 26th of February, in the full possession of his senses.

He was attended to by his sister (Miss Meller), who accompanied him from the Mauritius, and who has since left for England (*viâ* Mauritius) the early part of this month. GEORGE BENNETT.

Sydney, March 25th, 1869.

Importation of American Seeds to Australia.

In my attempts to obtain acorns of American Oaks and nuts of the American Hickory-trees in a state of vitality, for raising these noble trees here in our southern latitudes, various modes of packing were adopted. You may be interested in the result, as many cultivators would gladly secure the seeds of these valuable trees for distant localities. *Packing in dry sand* succeeded always best ; for not only the seeds of the American species of *Juglans, Quercus,* and *Carya* came thus safely a voyage of fully three months, but in a similar manner I secured Assam Tea seeds fit for germination, the seeds being more

than two months on their way. I need scarcely add, that Mediterranean and Indian acorns travelled in the same manner quite safely. I cannot conclude this brief note without a public acknowledgment of the great generosity of the illustrious Asa Gray in arranging for the transmission of copious collections of these American seeds. FERD. VON MUELLER.

Melbourne, March 28th, 1869.

The Cocoa-Nut in Australia.

Mr. C. Moore, Director of the Sydney Botanical Garden, in a lecture on endogenous plants, has stated that—"It was somewhat singular that the Cocoa-nut had never been discovered growing on the continent of Australia, excepting the instance mentioned by M'Gillivray, and from his account it would almost seem that it had been planted. . . . The Cocoa-nut Islands surrounded the northern portion of the continent, and the nuts had been found by Mr. King and other surveyors along the coast; but it was not known that they had ever taken root, excepting where, as at Rockingham Bay, they had been planted." That gentleman will be pleased to hear that at Emu Park, Cawarral, about twenty-six miles east of Rockhampton, on an open sandy flat, within 300 yards of the sea, we have a Cocoa-nut growing; its diameter at the butt is eighteen inches, and its height about forty-five feet; its stunted and crooked growth near the base shows unmistakable proof of the many struggles it has sustained against hurricanes and bush fires. The nuts it bears are rather small, limited in quantity, and below the average of those borne by a vigorous plant. These circumstances bring it within the period when the products diminish, and which, at the Gulf of Cariaco, according to Humboldt, take place after forty years. It would, however, be difficult to make any correct estimate about the age of the tree in question; but I venture to say that it is above sixty years old. Was the nut planted there by some navigator?—or forgotten by the aboriginals, who gather them by thousands along our coast, and use them as food? Or, was it carried where the tree stands now, at the top of a wave during a very heavy sea? The spot is not one a seaman would have chosen as likely, for planting a Cocoa-nut, to mark his visit on the Australian shores. Aware of the presence of the Cocoa-nut-tree on the surrounding islands, he would naturally have supposed its existence also on the mainland. Failing to find . reasonable motive, I may be allowed to dismiss the first supposition. The second could have happened, under certain conditions; but, again, the nut would probably have remained uncovered, and the chance of a proper germination diminished. The most plausible supposition is the third. By a strong wind and current, a nut could be carried rapidly from an island, preserve all its vitality, and be buried slightly at the end of the waves, under sand and vegetable matter. After a careful investigation, I am inclined to think that such was the fact, and that what has happened at Emu Park must have also happened at different points of our very imperfectly botanically-explored coast. It was only six years after a large population had settled on the basin of the Fitzroy River that the first in-

timation of the existence of a Cocoa-nut-tree growing at Cawarral was given by Mr. Robert Spencer. I shortly after secured specimens of the leaves, flowers, and fruits for identification, which I forwarded in November, 1864, to our illustrious Australian botanist, Dr. Ferdinand von Mueller, who mentioned the discovery in his 'Fragmenta Phytographiæ,' vol. v. p. 49, and ultimately in his review of the Australian vegetation for the Melbourne and Paris Exhibitions. The aboriginals unroot the already growing plant, to secure the smallest part of the albumen remaining eatable. Does not such want of forethought by these children of nature establish sufficiently one of the principal causes of the paucity of the Cocoa-nut on our eastern Australian coast? I have no doubt that, as the settlers on the coast will increase, they will reveal, as has been already the case in a few instances, the occurrence in several other localities of that useful Palm, and still extend its geographical distribution, which seems now to be limited to so few individuals. Will it ever be found in large groups? I am, etc.,

A. Thozet.

Remarks on Dr. Lindsay's Paper "On Chemical Reaction as a Specific Character in Lichens."

Dr. Lindsay, in his paper (Journ. Linn. Soc., Botany, pp. 36–63, 1869), attempts to show the slight degree of faith that ought to be placed in the chemical criteria proposed by me for distinguishing with facility one from another a great number of species of Lichens, between which, in the absence of these means, it is frequently extremely difficult, or even impossible, to discriminate. It is not my intention to follow the author through the long development he has thought proper to enter into; such a task would assuredly be altogether superfluous, for evidence is not to be denied, and to any one able to see, and in suitable conditions for such researches, the reactions here in question are as evident as they are easy to produce. Nothing in them is "supposed," as Dr. Lindsay would have it.

The reddish hue sometimes produced on the altered basis of certain old thalli of, *e.g.*, *Platysma nivale* by the application of potash or of liquid ammonia, has nothing to do with the *chrysophanic* acid reaction, as contended by Dr. Lindsay; it is but the result of an accidental or anomalous state of these Lichens. All the other examples set forth by him are like the one just alluded to, or altogether inaccurate. In like manner, if the thallus of *Physcia parietina* or of *Placadium murorum*, growing in the shade, becomes greenish, and is shown to contain less chrysophanic acid, is the chemical character belonging to these Lichens in their normal or typical state impaired on that account?

Dr. Lindsay speaks of the numerous cases he has observed of inconstancy in chemical character; but is he quite sure the Lichens he has had to deal with are correctly named? Is it not probable, rather, that where he fancied he discovered variability in the reactions (the result, according to him, being sometimes positive and sometimes negative) he had to do with different species? He himself allows he is unacquainted with the common *Parmelia olivetorum*! *Ab uno disce omnes.*

He asserts that my "observations* are not confirmed by other authorities." This is not quite true, for I see them approved of on all sides, and I am confident Dr. Lindsay's authority will not suffice to invalidate them.

The colouring effects produced by chloride of lime† are generally very evident; but the reagent must necessarily be of good quality, and has to be renewed when enfeebled by exposure. In some lichens, however, in several *Umbilicariæ* for instance, the erythrinic reaction is typically weak; in which case this weakness is itself characteristic.

The other newly proposed agent, hydrate of potash (*hydras kalicus* or *kali causticum*), likewise frequently offers but faint reactions, especially in *Cladoniei*, but it is not less indispensable in the discrimination of their species. The reactions of *lecanoric* acid (yellow and red) are, generally speaking, very clear (in *Parmeliei, Lecanorei*, etc.); those of *chrysophanic* acid are still more so.

The instrument I use for applying the reagents is a goosequill sharpened into a point; with this I touch but a very small extent either of the cortical layer (or the apothecia) or of the medulla, observing at the same time the effects of the application through a magnifier. My researches have proved that these means often afford the best, the surest, and the easiest way of recognizing a great number of Lichens. To Dr. Lindsay, then, who is of an opposite opinion, it only remains for me to apply what I have elsewhere written in an analogous case: "Eos, qui erroribus sunt dediti, nulla castigatio acrior attingere potest quam si errores suos conservant et in falsis computationibus permanent."

I am, etc.

Paris, June, 1869. W. NYLANDER, M.D.

BOTANICAL NEWS.

The Trustees of the British Museum have established an additional assistantship in the Botanical Department, and we congratulate them on the appointment of so able and promising a botanist as Dr. Henry Trimen to the new office. He entered on his duties early in May last.

Dr. Seemann returned to England on the 12th of last month, after an absence of several months in Central America and the Isthmus of Panama.

The 'Gardeners' Chronicle' is authorized to contradict the report that it

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* They are entirely independent of those of the Rev. W. A. Leighton, who has made a series of applications of my discovery to *Cladoniei*.

† This is the powder of Tennant and Knox (in Latin *hypochloris calcicus*, *oxymurias calcius*, or *calx oxymuriatica*), in no way "hypochlorite of *calcium*" as written by Dr. Lindsay, who has made use of a pharmaceutical preparation of doubtful value. Nor are tincture of iodine and its aqueous solution identical as regards their reactions. Dr. Lindsay is consequently wrong in saying, "I am not aware of any advantage this solution" (the aqueous one with the addition of iodide of potassium) "possesses over our officinal tincture of iodine, diluted with water to such extent that the liquid has only a pale sherry colour."

was at Dr. Hooker's advice those Englishmen who attended the St. Petersburg Exhibition were not decorated.

The tenth and concluding part of Seemann's 'Flora Vitiensis' is now in the course of preparation, all the plates (100) having already been printed.

Dr. F. Mueller's able 'Official Report on the Melbourne Botanical Garden for 1869' has just come to hand, and will be found in another part of this Journal.

A Pharmaceutical Congress, to which all civilized nations are invited to send representatives, is to take place at Vienna in September.

The 'Portland (Maine) Advertiser' was recently printed on paper made of a kind of material said to have been never before used in the manufacture of paper—*Zizania aquatica*, or Water Rice. It grows in great abundance in many places in the north-west of America.

Mr. Collins, whose paper on India-rubber appeared in this Journal last year, is now working up the subject of Gutta Percha, and would be glad if any of our correspondents could communicate any authentic specimens, etc. of any of the Guttas, as Gutta Mutah, Tuban, Percha Claison, etc., addressing them to the Museum of the Pharmaceutical Society, Bloomsbury Square, London.

EDINBURGH BOTANICAL SOCIETY.—Thirty-third Session, Fifth Meeting.—The Society met on the 11th of March, Dr. Cleghorn, President, in the chair. The following communications were read:—I. Notes of a Twelve Days' Visit to Sicily, in February, 1868. By Dr. H. Cleghorn. Dr. Cleghorn described the present state of the Botanical Gardens at Syracuse, Catania, and Palermo, and enumerated the principal plants observed in flower at the time of his visit. He described the scenery of the island, and drew attention to the increased facilities of travelling afforded by two railways now open. The Agricultural Institution at Castelnuovo, with its model farm, under the able management of Professor Inzenga, was mentioned, as furnishing a good example of the successful training of youths in rural pursuits. From the dryness of the climate, the seeds ripened at Palermo have been very suitable for the agri-horticultural societies of North India. II. Report on the Cultivation of Chinchona in Bengal for the year 1867-68. By Thomas Anderson, M.D., Superintendent, Botanical Gardens, and in charge of Cinchona Cultivation in Bengal (*vide* p. 155). III. Notes on a Visit to the Hot Springs of Jumnotri in 1860. Part 2. By Mr. Wm. Bell. IV. On the form of the Archetypal Leaf. By Dr. Joseph Bullar. The author believed that the orbicular form of leaf was the archetypal one, the divisions of its veins representing the divisions in the calyx, corolla, and the other whorls of the flowers. Professors Balfour and Dickson doubted the correctness of Dr. Bullar's theory. V. Notice of the Occurrence of *Rhamnus Frangula* in Ross-shire. By Dr. F. Buchanan White. VI. Report on the Open-Air Vegetation at the Royal Botanic Garden. By Mr. M'Nab. VII. Miscellanous Communications. 1. Dr. Buchanan White presented specimens of *Funaria Hibernica*, which he had collected in September, 1868, growing on rocks on Tor Achilty, Ross-shire. This is the first time that this moss has been detected in Scotland. 2. Professor Dickson made some remarks regarding the indurated structure of the albumen in the seed of *Convallaria majalis*, preparations of which he exhibited under the microscope.

Tab. 94

J. Miers, anal. et del. — W. G. Smith, lith.

Vincent Brooks Day & Son imp.

Worthington G. Smith, del et lith

Vincent Brooks, Day & Son, Imp

ON THE GENUS SYMBOLANTHUS.

By John Miers, Esq., F.R.S., F.L.S., etc.

(Plate XCIV.)

The genus *Symbolanthus*, established by G. Don in 1837, consisting of two species, natives of New Granada and Peru, was divided by Grisebach, in 1845, into two separate genera: to the former species, originally described by Kunth as *Lisianthus anomalus*, he now gave the name of *Leiothamnus anomalus*, designating the latter species, first described in the 'Flora Peruviana' as *Lisianthus calycogonus*, R. and P., under the name of *Symbolanthus calycogonus*, Griseb.; but Don's name of *S. Pavonii* will claim the preference on account of its having a priority of eight years. Among the plants collected by Weir in 1863, for the Royal Horticultural Society, is a new and handsome species of this genus from the Rio Magdalena, which is here figured. A more detailed character of the Peruvian species is here first given, in order that Weir's plant may be compared with it.

1. *Symbolanthus Pavonii*, G. Don (1837), Dict. iv. 210; *S. calycogonus*, Griseb. (1845), De Cand. Prodr. ix. 80; *Lisianthus calycogonus*, R. and P. (1799), Fl. Per ii. 14, t. 126; fruticosa, glabra, ramosa, ramis obtuse 4–6-gonis, ad nodos annulatis; foliis oppositis, lanceolato-oblongis, utrinque acutis, penninerviis, marginibus parum revolutis, petiolo imo crassiore, cum opposito in annulum connato, limbo 15-plo breviore; floribus in axillis terminalibus opposite solitariis, pedicellatis, pedicello recurvato, calyce dimidio breviore, imo bracteis 3 acuminato-ovatis concavis donato; calyce 5-gono, 5-sepalo, sepalis erectis, margine membranaceis et fimbriatis, 3 exterioribus lanceolatis, 2 interioribus imo subsagittatis; corolla magna, rubro-rosea, tubulosa, tubo superne ventricosa, calyce 3-plo longiore, fauce constricto, paulo obliquo, limbi laciniis 5, cordato-ovatis, imo imbricatis, apice acutis, reflexis, margine crenulatis; staminibus erectis, inclusis, filamentis subulato-filiformibus, ex annulo 5-dentato fere basali enatis; antheris sagittato-oblongis; capsula magna, ovata, acuta.—In Peruvia alta, prov. Huanuco, ad Acomayo, etc. (lat. 10°); *non vidi.*

This is said to be a shrub 6 feet high and quite glabrous; axils 9 lines apart; leaves 2¼-2¾ in. long, 1 in. broad, on a petiole 2 lines

long; pedicels 6 lines long; sepals 1 in. long, $\frac{1}{2}$ in. broad; tube of corolla $2\frac{3}{4}$ in. long, 10 lines diameter above the middle, contracted to 6 lines in the mouth; segments of border 1 inch long, 10 lines broad; capsule $2\frac{1}{4}$ in. long, 1 in. in diameter, enveloped by the enlarged calyx.

2. *Symbolanthus superbus*, n. sp.; glaberrimus, ramulis 4-gonis, fistulosis, annulato-nodosis; foliis late ellipticis vel oblongis, imo acutis, apice breviter acute attenuatis, utrinque, læte viribus, pauci-nerviis, nervis remotis vix prominentibus, eveniis; petiolis compressis, canaliculatis, imo dilatatis, et in annulum circa caulem coalitis; floribus terminalibus, axillaribus, ternato-verticellatis; pedicellis erectis, calyce longioribus, imo bracteis 3 parvis acutis membranaceis munitis; sepalis 5, imbricatis, oblongis, obtusis, marginibus membranaceis et integris, medio nervo crasso carinatis; corolla speciosissima, tubo rubro-roseo, campanulato-infundibuliformi, sepalis plusquam 2-plo longiore, ore amplo subobliquo, limbi segmentis orbicularibus, apice subito acuminatis, imo late auriculato-expansis, et imbricatis, subreflexis; staminibus parum inclusis, imo dilatato-compressis, in annulum fere basalem connatis, apice filiformibus et circa antheras circinatim contortis, antheris imo divaricatis, arcuatim curvatis; ovario conico-oblongo, disco annulari insito; stylo subulato, stigmate 2-lamellato, faucem attingente. —In Nova Granada, *v. s.* Rio Magdalena (Weir, 95).

A beautiful plant, apparently of more herbaceous growth than the preceding species, from which it also differs in its larger leaves, upon a longer petiole, its more campanular corolla, and its stamens spirally convoluted around the arcuated anthers. The axils are about $1\frac{3}{4}$ in. apart; the leaves are $3\frac{1}{2}$–$4\frac{1}{2}$ in. long, $1\frac{3}{4}$–$2\frac{3}{4}$ in. broad, on a petiole $\frac{1}{2}$–$\frac{3}{4}$ in. long; the pedicels are $1\frac{1}{4}$ in. long; the sepals 1 in. long, 5 lines broad; the tube of the corolla is 2 in. long, 1 in. in diameter at the mouth, the segments of the border are 1 in. long, 1 in. broad, the stamens scarcely extend beyond the mouth, being spirally curved for more than a revolution around the anthers; the stigmata are spathulately oblong, 2 lines long, $1\frac{1}{2}$ line broad.

Explanation of Plate XCIV., representing *Symbolanthus superbus*, Miers, from specimens collected by Mr. Weir.—Fig. 1, an entire branch. Fig. 2, corolla laid open. Fig. 3, a stamen.—Figs. 2 and 3 *slightly magnified*.

INDEX CRITICUS BUTOMACEARUM, ALISMACEARUM JUNCAGINACEARUMQUE HUCUSQUE DESCRIPTARUM.

AUCTORE DR. FR. BUCHENAU.*

(From the 'Abhandlungen des Naturwissenschaftl. Vereines zu Bremen.)

BUTOMACEÆ, *L. C. Rich.* (Proposition d'une nouvelle famille des Plantes: les Butomées (Butomeæ) in Mémoires du Museum d'Hist. Nat. 1815, i. 364.)

ALISMA flavum, L., Sp. Plant. ed. 1. 1753 = Limnocharis flava, Buchen.

BUTOMOPSIS, Kunth, Enum. 1841, iii. 164 = Tenagocharis, Hochst.

B. Cordofana, Kth. in Walp. Ann. 1849, i. 769 = Tenagocharis latifolia, Buch.

B. lanceolata, Kth. Enum. 1841, iii. 165 = Tenagocharis latifolia, Buchen.

B. (?) latifolia, Kunth, Enum. 1841, iii. 165 = Tenagocharis latifolia, Buchen.

BUTOMUS, L. Syst. Nat. ed. 1, 1735; Gen. Plant. ed. 1, 1737, n. 340.

B. floridus, Gærtn. Fruct. 1788, i. 74 = B. umbellatus, L.

B. junceus, Turcz. Catal. Baik. n. 1079 = B. umbellatus, β. minor, Ledeb.

B. lanceolatus, Roxb. Fl. Ind. 1832, ii. 315 = Tenagocharis latifolia, Buchen.

B. latifolius, Don, Prodr. Fl. Nep. 1825, 22 = Tenagocharis latifolia, Buchen.

B. umbellatus, L. Sp. Pl. ed. 1, 1753.

B. umbellatus, β. minor, Ledeb. Fl. Ross. 1853, iv. 44.

B. vulgaris, Güld. It. ii. 22 = B. umbellatus, L. teste Ledebour, Fl. Ross. 1853, iv. 43.

DAMASONIUM flavum, Mill. Dict.; edit. Germ. a me visa: Ph. Miller, Allgemeines Gärtnerlexikon, nach d. Engl. 8. Auflage übersetzt, Nürnberg, 1772, ii. 3 = Limnocharis flava, Buchen.

HYDROCLEIS Commers. L. C. Rich. l. c. 368 et 373.

? Hydrocleis azurea, Schult. fil. Msc. in Herb. Reg. Monac., teste Seubert in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 118, species dubia.

H. Commersoni, L. C. Rich. l. c. 368 et 373, species valde dubia, probabiliter = H. nymphoides, Buchen.

H. Humboldtii, Endl. Gen. Plant. 1836, 129 = Hydrocleis nymphoides, Buch.

H. Martii, Seub. l. c. 116.

H. nymphoides, Buchen.

H. parviflora, Seub. l. c. 117.

LIMNOCHARIS, H. et B. Pl. Æquinoct. 1808, i. 116.

L. Commersoni, Spreng. Linn. Syst. Veg. 1825, ii. 634 = Hydrocleis Commersoni, L. C. Rich.

L. emarginata, H. et B. Pl. Æquinoct. 1808, i. 116 = L. flava, Buchen.

L. flava, Buchen.

L. Hænkei, Presl, Rel. Hænk. 1830, i. 88, planta dubia.

L. Humboldtii, L. C. Rich. l. c. 369 et 374 = Hydrocleis nymphoides, Buch.

L. Laforesti, Duchaiss. in Griseb. Nov. Fl. Panam. Bonplandia, 1858, vi. 11.

L. Plumieri, L. C. Rich. l. c. 370 et 374 = L. flava, Buchen.

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* Dr. Buchenau has quite recently published in the Nachrichten von der Königl. Gesellschaft der Wissenschaften zu Göttingen, June 16, 1869, a critical list of the Butomaceæ, Alismaceæ, Juncaginaceæ, and Juncaceæ, collected by the Brothers von Schlagintweit in High Asia. Amongst the Juncaceæ there are some novelties.

SAGITTARIA ranunculoides, Arrabida (Velloz) Fl. Flum. 1827, x. t. 32 = Hydrocleis nymphoides, Buchen.

STRATIOTES nymphoides, H. et B. in Willd. Linn. Sp. Pl. ed. 4, 1805, iv. 821 = Hydrocleis nymphoides, Buch.

TENAGOCHARIS, Hochst. Pl. Nub. Nov. Gen. in Flora 1841, 369.

T. alismoides, Hochst. in Flora, 1841, Intelligenzblatt n. 3, 42 = T. latifolia, Buchen.

T. Cordofana, Hochst. in Fl, 1841, 369 = T. latifolia, Buchen.

T. latifolia, Buchen.

VESPUCCIA, Parl. Nuov. Gen. e Sp. di Piante Mon. 1854, 55.

V. Humboldtii, Parl. l. c. 56 = Hydrocleis nymphoides, Buchen.

ALISMACEÆ, *De Cand.* (excl. gen.). Fl. Fr. 1805, iii. 181.

ACTINOCARPUS, R. Br. Prod. Fl. Nov. Holl. 1810, 342 = Damasonium, Juss.

A. australis, Spr. in Ersch et Gruber, Encycl. 1818, i. 348 = Damasonium australe, Salisb.

A. Damasonium, Sm. in Rees, Cycl. Suppl. n. 1, teste Kth. Enum. 1841, iii. 155 = Damasonium stellatum, Pers.

A. Europæus, Spr. in Ersch et Gruber, Encycl. 1818, i. 348 = Damasonium stellatum, Pers.

A. minor, R. Br. Prod. Fl. Nov. Holl. 1810, 342 = Damasonium australe, Salisb. (teste Salisbury ipso) = Damasonium minus (R. Br.), Buchen.

ALISMA, L. Syst. Nat. ed. 1, 1735; Gen. Plant. ed. 1, 1737, n. 308.

A. acanthocarpum, F. Muell. Fragm. Phyt. Aust. 1858, i. 23.

A. alpestre, Coss. sur Deux Espèces. Nouv. d'Esp. in Bull. Soc. Bot. de Fr. 1864, xi. 333.

A. ancile, Mart., teste Steudel, Nom. Bot. 1840, 491 = Echinodorus Guianensis, Griseb.

A. Andrieuxii, Hook. et Arn. Bot. Beech. Voy. 1839, 311.

A. angustifolium, Gilib. Fl. Lith. 1781, v. 224 = Echinodorus ranunculoides, Engelm.

A. arcuatum, Michalet in Grenier et Godron, Fl. de France, 1855, iii. 165 = A. Plantago, L.

A. Berterii, Spreng. Linn. Syst. Veg. ed. 16, 1825, ii. 163 = A. Sprengelii, Kunth = Echinodorus cordifolius, Griseb.

A. Berteroanum, Balb. in Röm. et Schult. Linn. Syst. Veg. 1830, vii. ii. 1605 = A. macrophyllum, Kunth, β. minus, Seub., teste Seub. in Endl. et Mart. Fl. Bras. 1847, fasc. 8, 108 = Echinodorus cordifolius, β. Berteroanus, Griseb. (teste Griseb. .

A. canaliculatum, Al. Br. et Bouché Index Sem. Hort. Bot. Berol. 1862, 5 = A. Plantago, L. (testibus auctoribus ipsis in App. Spec. Nov., minus cognitarum, criticarum quæ in Hort. Reg. Berol. coluntur 1867, 1868, 4.)

A. cordifolium, L. Sp. Pl. ed. 1, 1753 = Echinodorus cordifolius, Griseb.

A. cordifolium, L. pro parte = A. macrophyllum, Kunth (teste Seub. in Endl. et Mart. Fl. Bras. 1847, fasc. 8. 108) = Echinodorus cordifolius, Griseb.

A. cordifolium, Aut. pro parte = A. floribundum, Seub. (teste Seub. l. c. 109).

A. cordifolium, Thunb. Fl. Jap. 1784, 153 = A. Plantago, L. ? (teste Miquel, Prolusio Fl. Jap. in Ann. Mus. Lugd. Bat. 1866, ii. 138.)

A. cordifolium, Sw. Observ. Bot. 1791, 139 = A. macrophyllum, Kunth, β. minus, Seub. (teste Seubert in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 108.)

A. Damasonium, L. Sp. Plant. ed. 1, 1753 = Damasonium stellatum, Pers.

A. Damasonium, L. Desf. Fl. Atlantica, 1798, i. 324 = Damasonium Bourgæi, Coss. (teste Munby, Cat. Plant. in Algeria sponte nasc. Lond. 1866, 32).

A. Damasonium, Willd. Fl. Berol. Prod. 1787, n. 415 = A. parnassifolium, L. (Caldesia, Parlatore).

A. diversifolium, Gilib. Fl. Lith. 1781, v. 223 = Elisma natans, Buchen.

A. dubium, Willd. Fl. Berol. Prod. 1787, 132 = Caldesia parnassifolia, Parl.

A. echinocarpum, Seub. in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 105 = Echinodorus Guianensis, Griseb.

A. ellipticum, Mart. in Römer et Schultes, Linn. Syst. Veg. 1830, vii. ii. 1607.

A. ellipticum, β. minus, Seub. in Endl. et Mart. Flor. Bras. 1847, fasc. viii. 107.

A. enneandrum, Hochst. in Sched. = Echinodorus (?) enneander, A. Br.

A. flavum, L. Sp. Plant. ed. 1, 1753 = Limnocharis flava, Buchen.

A. flavum, Thunb. Fl. Jap. 1784, 153 = A. Plantago, L.? (teste Miquel, Prol. Fl. Jap. in Ann. Mus. Lugd. Bat. 1866, ii. 138).

A. floribundum, Seub. in Endl. et Mart. Flor. Bras. 1847, fasc. viii. 109 (an diversum ab Echinodoro cordifolio, Griseb.?).

A. Geyeri, Torr. in J. N. Nicollet, Rep. on the Hydrographical Basin of Upper Mississippi, 1843, 162 (26 Congr. 2 Sess. Senate Documents) = Alisma Plantago, L. (forma minor, foliis lanceolatis).

A. glandulosum, Thw. Enum. Plant. Zeyl. 1864, 332.

A. gramineum, Gmel. Fl. Bad. 1826, iv. 256 = A. Plantago, var. γ. graminifolium.

A. graminifolium, Ehrh. Herb. = A. Plantago, γ. graminifolium (Kunth, Enum. 1841, iii. 149).

A. grandiflorum, Cham. et Schl. Pl. Romanzoff. in Linn. 1827, ii. 152.

A. humile, Kunth, 1841, iii. 154 = Echinodorus humilis, Buchen.

A. intermedium, Mart. in Röm. et Schult. Linn. Syst. Veg. 1830, vii. ii. 1609 = Echinodorus intermedius, Griseb.

A. Kotschyi, Hochst. in Coll. Pl. Nub. el. Kotschyi, n. 169 = Limnophyton obtusifolium, Miq.

A. lanceolatum, Schultz. teste C. Sprengel in Linn. Syst. Veg. 1825, ii. 163 = A. Plantago var.

A. lanceolatum, With. Arr. 362, teste Schur, Enum. Transsilv. 1866, 629 = A. Plantago, var. lanceolatum.

A. latifolium, Gilib. Fl. Lith. 1781, v. 222 = A. Plantago, L.

A. Loeselii, Eichw. Naturhist. Skizze von Litthauen, Volhynien und Podolien, 1830, 127 = A. Plantago, γ. graminifolium (Kunth, Enum. 1841, iii. 149).

A. macrophyllum, Kunth, Enum. 1841, iii. 151 = Echinodorus cordifolius, Griseb.

A. macrophyllum, Kunth, β. minus, Seub. in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 108 = Echinodorus cordifolius, β. Berteroanus, Griseb.

A. majus, S. Fr. Gray, Nat. Arrangem. Brit. Pl. 1821, ii. 216 = A. Plantago, L.

A. majus, β. lanceolatum, S. Fr. Gray, l. c. = A. Plantago, β. lanceolata.

A. minus, Spr. Linn. Syst. Veg. ed. 16, 1825, ii. 163 = Actinocarpus minor, R. Br. (teste Spreng. ipso).

A. natans, L. Sp. Pl. ed. 1, 1753 = Echinodorus natans, Engelm. = Elisma natans, Buchen.

A. natans, Poll. Hist. Plant. in Palatinatu Sponte Nasc. 1777, iii.

319 = A. Plantago, var. graminifolium.

A. natans, Pursh, Fl. Amer. Septentr. 1816, i. 253. Planta dubia.

A. natans, β. lanceolatum, G. Brückn. in Boll, Flora v. Mecklenburg in Archiv d. Freunde d. Naturgeschichte in Mecklenburg, 1860, xiv. 302 = Elisma natans, Buchen.

A. natans b. sparganiifolius, Fries v. P. Ascherson, Flora der Mark Brandenburg, 1864, i. 652 = Elisma natans, Buchen.

A. natans, c. repens, Rchb. Ic. Fl. Germ. vii. 29 = Elisma natans, Buchen.

A. nymphæifolium, Griseb. Catal. Plant. Cubens, 1866, 218.

A. obtusifolium, Thwaites, Enum. Plant. Zeyl. 1864, 332 = Limnophyton obtusifolium, Miq.

A. oligococcum, F. Mueller, Fragm. Phyt. Austr. 1858, i. 23.

A. ? palæfolium, Kth. Enum, 1841, iii. 152 = Sagittaria palæfolia, Nees et Mart.

A. parnassifolium, Bassi in Linn. Syst. Nat. ed. 12, 1768, iii. (Caldesia, Parl.; Echinodorus, Eng.)

A. parnassifolium, var. Baumgartenianum, Schur. Enum. Plant. Transsylv. 1866, 630.

A. parviflorum, Pursh, Fl. Amer. Sept. 1816, i. 253 = A. Plantago, var. Americanum (A. Gray, Man. Bot. 1856, ed. 2, 438).

A. Plantago, L. Syst. Nat. ed. 10, 1759, ii. (A. Plantago aquatica, Linn. Sp. Plant. ed. 1, 1753).

A. Plantago, var. æstuosum, Bolle, Alismaceen-formen der Mark in Verh. d. Bot. Vereins f. Brand. 1862, iii. 164 = A. arcuatum, Michalet (teste Bolle, Ascherson in litt.).

A. Plantago, var. Americanum, Schultes in Römer et Schultes, Linn. Syst. Veg. 1830, 7, ii. 1598.

A. Plantago, β. angustifolium, Ledeb. Fl. Ross. 1853, iv. 40 = A. Plantago, var. lanceolatum.

A. Plantago, diversifolium, Schur, Beitr. z. Flora v. Wien, in Oesterr. Bot. Zeitschr. 1861, 95.

A. Plantago, var. graminifolium, Wahl. Fl. Suecica 1824, i. 228. testibus Römer et Schultes Syst. Veg. 1830, vii. ii. 1598.

A. Plantago, β. lanceolatum, Mart. Prod. Fl. Mosq. ed. Lips. 1817, 66.

A. Plantago, b. luxurians, Grogn. Plantes vascul. Dép. Saône et Loire, in Mém. d'Hist. Nat.; publ. Soc. Éduenne 1865, i. 195.

A. Plantago, γ. minor, Miq. Prol. Fl. Jap. in Ann. Mus. Lugd. Bat. 1866, ii. 138 = A. Plantago, foliis elliptico-oblongis, parvulis.

A. Plantago, var. obtusifolia, Spreng., Linn. Syst. Veg. 1825, ii. 163, teste Kunth, Enum. 1841, iii. 149.

A. Plantago, var. parviflora, Torr. Fl. north and middle sections of United States, 1824, i. 382 = A. Plantago, var. Americanum.

A. Plantago, β. sterilis, Miq. in Ann. Mus. Lugd. Bat. 1866, ii. 138 = A. Plantago, fol. ovatis acutis, basi rotundatis vel emarginatis.

A. pubescens, Mart. in Röm. et Schultes, Linn. Syst. Veg. 1830, vii. ii. 1608.

A. pubescens, β. Claussenii, Seub. in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 107.

A. ranunculoides, Linn. Sp. Plant. ed. 1, 1753 = Echinodorus ranunculoides, Eng.

A. ranunculoides, Willd. Fl. Berol. Prod. 1787, 133 = Elisma natans, Buchen (teste Kunth, Enum. 1841, iii. 150).

A. ranunculoides Nocc. et Balb. Fl. Ticin. 1816, i. 176 = A. Plantago, γ.

graminifolium, Kunth (teste Kunth, Enum. 1841, iii. 149).

A. ranunculoides, var. Brasiliensis, A. de St. H. Voy. Distr. Diam. 1833. ii. 432 = A. tenellum, Mart. (teste Steud. in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 105) = Echinodorus tenellus, Buchen.

A. ranunculoides, β. repens, S. Fr. Gray, Nat. Arrange. Brit. Plants, 1821, ii. 217 = Echinodorus ranunculoides, β. repens.

A. ranunculoides, var. repens, De Cand. et Duby, Bot. Gall. 437, teste Kunth, Enum. 1841, iii. 150.

A. ranunculoides, All. C. Allione, Fl. Pedemont. 1785, i. 243, fide Balb. = A. Plantago, β. angustifolium (Kunth, Enum. 1841, iii. 148).

A. ranunculoides zosterifolium, Fr. (teste Ascherson, Fl. Prov. Brand. 1864, i. 651) = Echinodorus ranunculoides, var. foliis zosteraceis.

A. reniforme, Don, Prodr. Fl. Nepal. 1825, 22.

A. repens, Lam. Dict. Encycl. Méth. Bot. 1790, ii. 515 = Echinodorus ranunculoides, Engelm., var. repens.

A. roseum, Raf., teste Steudel, Nomencl. Bot. ed. 2, 1840, i. 49, mihi ignotum, an = Alisma Plantago, L.?

A. rostratum, Nutt. Collections towards flora of Arkansas Territory in Trans. Amer. Phil. Soc. 1837, v. 159 = Echinodorus rostratus, Engelm.

A. sagittifolium, Willd. in Spec. Plant. ed. 4, 1799, ii. 277 = Limnophyton obtusifolium, Miq.

A. Sprengelii, Kunth, Enum. 1841, iii. 154, an = A. subalatum, Mart.? (teste Seubert in Endl. et Mart. Fl. Brass. 1847, fasc. viii. 107) = Echinodorus cordifolius, Griseb. (teste Grisebach über die Vegetation der Karaiben in Abhandl. der Kön. Gesellsch. d. Wiss. zu Göttingen, 1857, vii. 257, und Fl. Brit. West Ind. Islands, 1864, 505).

A. stellatum, Lam. Dict. Encycl. Bot. 1790, ii. 514 = Damasonium stellatum, Pers.

A. subalatum, Mart. in Röm. et Schult. Linn. Syst. Veg. 1830, vii. ii. 1609 = Echinodorus subalatus, Griseb.

A. subalatum, Mart., α. majus, Schult. l. c.

A. subalatum, Mart., β. medium, Schult. l. c.

A. subalatum, Mart., γ. minus, Schult. l. c.

A. subcordatum, Raf. in Med. Rep. of N. York, v. 356? = A. Plantago, ε. Americanum (teste Kunth, Enum. 1841, iii. 149).

A. subulatum, L. Spec. Plant. ed. 1, 1753 = Sagittaria pusilla, Nutt.

A. tenellum, Mart. in Röm. et Schult. Syst. Veg. 1830, vii. ii. 1600 = Echinodorus tenellus, Buchen.

A. trinerve, Link; Steudel, Nomen. Bot. ed. 2, 1840, i. 49, mihi ignotum (an Alisma Plantago, Echinodorus ranunculoides, Damasonii spec.?).

A. triviale, Pursh, Fl. Amer. Sept. 1816, i. 252 = A. Plantago, var. Americanum, Schultes.

A. virgatum, Hook. and Arn. Bot. Beech. Voy. 1839, 311.

Species sequentes Ind. Orient. nominibus tantum cognitæ sunt:

A. apetalum, H. Ham. in Wallich, Numerical List of Dried Specimens of Plants, 1828, 175, n. 4996, laps. calami; A. aphyllum in Steudel (Nomencl. Bot. ed. 2, 1840, i. 49).

A. calophyllum, Wall. ibid. 175, n. 4997 = A. parnassifolium? Ham. Hb.

A. cristatum, Wall. teste Steudel, ibid.

A. pubescens, Ham. (A. Nathpurense, Steud.); Steudel ibid.

A. stellatum, Ham. Hb. (A. Hamiltonianum, Wall.); Steudel ibid.

Baldellia, Parl. Nuov. Gen. e Spec. di Piante Monoc. 1854, 57 = Echinodori spec., Eng.

B. ranunculoides, Parl. ibid. = Echinodorus ranunculoides, Eng.

Caldesia, Parl. Fl. Ital. 1858, iii. 598 = Echinodori spec., Eng.

C. parnassifolia, Parl. ibid. = Echinodorus parnassifolius, Engelm.

Cycnogeton, R. Br.

Damasonium, Juss. Gen. Plant. Sec. Ord. Nat. Disposita, 1789, 46.

Damasonium, Schreb. in C. Linnæi, Gen. Plant. ed. 8, 1789, i., teste C. L. Willdenow in C. Linnæi Sp. Plant. 1799, ii. 274 = Ottelia Persoon.

D. Alisma, Mill. Dict. ed. Germ. a me visa: Ph. Miller, Allgemeines Gärtnerlexikon; nach der Englischen 8. Auflage übersetzt. Nürnberg, 1772, ii. 3 = D. stellatum, Pers.

D. angustissimum, Walt. = Echinodorus ranunculoides, Engelm. teste Steudel, Nomencl. Bot. ed. 2, 1840, i. 48.

D. australe, Salisbury, On the Cultivation of Rare Plants in Trans. Hort. Soc. Lond. ed. 2, 1815, i. 268 = Actinocarpus minor. R. Br. teste Salisbury ipso.

D. Bourgæi, Coss. Pl. Nouv. du Midi de l'Espagne, 1849, ii. 47.

D. Californicum, Torr. in Benth. Pl. Hartweg. 1857, 341.

D. Dalechampii, S. F. Gray, Nat. Arrangem. Brit. Plants, 1821, ii. 217 = D. stellatum, Pers.

D. flavum, Miller, Dict., ed. Germ. a me visa: Ph. Miller, Allgemeines Gärtnerlexikon; nach der Englischen 8. Auflage übersetzt, Nürnberg, 1772, n. 3 = Limnocharis flava, Buchenau.

D. Indicum, Willd.; C. Linn. Sp. Plant. 1799, ii. 274 = Ottelia alismoides, Pers.; C. H. Persoon, Synopsis, 1805, i. 400; Stratiotes alismoides, L. (Smith, Ex. Bot. i. 27, t. 15, teste Salisb.) et Hymenotheca latifolia, Salisb. in Trans. Hort. Soc. Lond. ed. 2, 1815, i. 368.

D. minimum, J. Lange, Pugillus Plantarum imprimis Hispanicarum in Videnskabelige Meddelelser fra d. natur. Forening i Kjöbenhavn, 1860, 65.

D. minus, Buchen. = Actinocarpus minor, R. Br.

D. polyspermum, Coss. Pl. Nouv. du Midi de l'Espagne, 1849, ii. 47.

D. repens, Thuill. = Elisma natans, Buchen.

D. stellatum, Pers.* Syn. Plant. 1805, i. 400.

D. vulgare, Coss. Germ.; testibus Willkomm et Lange, Prodr. Fl. Hisp. 1861, i. 159 = D. stellatum, Pers.

Dipseudochorion, Buchen. Dipseudochorion, novum Alismacearum genus in Flora, 1865, 241 = Limnophyton, Miq.

D. sagittifolium, Buchen. ibid. = Limnophyton obtusifolium, Miq.

Echinodorus, L. C. Rich. Propos. d'une nouvelle Famille des Plantes, les Butomées, in Mém. du Mus. d'Hist. Nat. 1815, i. 365. Genus a cl. Engelmannio charact. emend. restauratum in A. Gray, Man. Bot. ed. 1, 1848, 460.

E. cordifolius, Griseb. über d. Flora der Karaiben in Abh. d. Kön. Ges. d. Wiss. zu Göttingen, 1857, vii. 257.

E. cordifolius, β. Berteroanus, Griseb.

* Ledebour in Flora Rossica, 1853, iv. 42, dicit: D. stellatum, L. C. Richard in Pers. Syn. i. 400.

E. (?) enneander, Al. Br. in Schweinfurth, Beitrag zur Flora Æthiopiens, 1867, 295 et 309.

E. Guianensis, Griseb. Fl. Brit. West Ind. Isl. 1864, 505.

E. humilis (Kunth), Buchenau, über die Richtung der Samenknospe bei den Alismaceen in Pringsheim, Jahrbücher für Wissenschaftliche Botanik, 1868, vii. 28.

E. intermedius, Griseb. Cat. Plant. Cuben. 1866, 218.

E. muricatus, Griseb. Nov. Fl. Panam. in Bonp. 1858, vi. 11.

E. natans, Engelm. in Ascherson, Fl. Prov. Brand. 1864, i. 651 = Elisma natans, Buchen.

E. natans, c. repens, Reichb.; Ascherson, Fl. Mark Brand. 1864, i. 652 = Elisma natans, Buchen.

E. natans, b. zosterifolius, Fr. Ascherson, ibid. = Elisma natans, Buchen.

E. parnassifolius (L.), Eng. Ascherson, ibid. 651 (Caldesia parnassifolia, Parl.).

E. tenellus, Buch., v. Alisma tenellum, Mart., et Echinodorus parvulus, Eng.

E. parvulus, Eng. in A. Gray, Man. Bot. ed. 2, 1856, 438.

E. radicans, Eng. ibid.

E. ranunculoides, Eng. in Ascherson, Fl. Prov. Brand. 1864, i. 651.

E. rostratus, Eng. in A. Gray, Man. Bot. ed. 2, 1856, 438.

E. subalatus, Gris. Cat. Plant. Cuben. 1866, 218.

E. subulatus, Gray (non Engelm.!) Man. Bot. ed. 1, 1848, 460 = E. parvulus, Eng.

Elisma, Buch. über die Richtung der Samenknospe bei den Alismaceen, in Pringsheim, Jahrbücher für Wissenschaftliche Botanik, 1868, vii. 25.

E. natans, Buch. ibid.

Limnophyton, Miq. Fl. Nederl. Ind. 1855, iii. 242.

L. obtusifolium, Miq. ibid.

Ottelia, Pers., est genus Hydrocharitacearum. O. alismoides, Pers. (Damasonium Indicum, Willd.).

Sagittaria, L. Syst. Nat. ed. 1, 1735; Gen. Plant. ed. 1, 1737, n. 723.

S. acutifolia, L. fil. Suppl. Plant. 1781, 419, vide S. pugioniformis, L.

S. acutifolia, Pursh, Fl. Amer. Sept. 1816, ii. 397 [S. simplex, Pursh (Eng. olim in A. Gray, Man. Bot. 1856, ed. 2, 439).] = S. graminea, Mich.; Eng. in A. Gray, Man. Bot. ed. 5, 1867, 494.

S. affinis, Seub. in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 111.

S. alpina, Willd. Linn. Sp. Plant. ed. 4, 1805, iv. 410 = S. sagittifolia, L.

S. alpina, α. submersa, Turcz. Fl. Baicalensi-dahurica in Bull. Soc. Imp. Mosc. 1854, iii. 58 = S. sagittifolia, L.

S. alpina, β. emersa, Turcz. ibid. = S. sagittifolia, L.

S. andina, Ph. Plant. Nov. Chilens. Cent. Quarta in Linnæa, xxix. 1857, 45, verisimiliter = S. Chilensis, var. minor.

S. angustifolia, Lindl. in Edwards' Bot. Reg. 1828, xiv. n. 1141 = S. lancifolia, L., var. angustifolia, Griseb.

S. aquatica, Lam. = S. sagittifolia, L. (teste Steudel, Nomencl. Bot. ed. 2, 1841, ii. 491.)

S. aquatica, S. Fr. Gray, Nat. Arrangem. Brit. Pl. 1821, ii. 154 = S. sagittifolia, L.

S. Blumei, Kunth. Enum. 1841, iii. 158.

S. bracteata, Willd. Herb. n. 17559, Pl. Humb. = Alisma echinocarpum, Seub. (testibus Chamisso et Schlechtendal, Pl. Mex. a Deppe et Schiede Coll. in Linnæa, 1831, vi. 42, et Seub. in Endl. et Mart. Fl. Brasil. 1847, fasc. viii. 105) = Echinodorus Guianensis, Gris.

S. Brasiliensis, Mart. Syst. Mat. Med. Veg. Bras. 47 excl. Vell. x. t. 31 = A. floribundum, Seub. (teste Seub. in Endl. et Mart. Flora Bras. 1847, fasc. viii. 109).

S. bulbosa, Donn, Hort. Cant. ed. 6, 246 = S. rigida, Pursh ? teste J. Sims in Bot. Mag. 1814, xxxix. 1631.

S. calycina, Eng. in Emory, U.S. and Mex. Bound. Surv. 1859, ii. 212.

S. calycina, γ. fluitans, Eng. in Emory, l. c.

S. calycina, var. grandis, Eng. in A. Gray, Man. Bot. ed. 5, 1867, 494 = S. calycina, α. maxima, Engelm.

S. calycina, α. maxima, Eng. in Emory, U.S. and Mex. Bound. Surv. 1859, ii. 212.

S. calycina, β. media, Eng. in Emory, l. c.

S. calycina, var. spongiosa, Engelm. in A. Gray, Man. Bot. ed. 5, 1867, 493.

S. Chilensis, Cham. et Schl. Plant. Romanzoff, in Linnæa, 1827, ii. 155.

S. Chinensis, Sims, Linn. Syst. Veg. ed. 16, 1825, ii. 632 (errore typographico) = S. Sinensis, Sims.

S. cordifolia, Lam. Dict. Bot. 1790, ii. 504, species valde dubia.

S. cordifolia, Roxb. Fl. Ind. 1832, iii. 647.

S. Doniana, Sweet, Hort. Brit. 1826, 375 = S. hastata, D. Don.

S. echinocarpa, Mart. Amœnitates Bot. Monacenses (sine anno) 6 = Alisma echinocarpum, Seub. = Echinodorus Guianensis, Griseb.

S. edulis, Schlecht. Plant. Leibold. in Linnæa, 1844, xviii. 432, v. S. macrophylla, Bunge.

S. falcata, Pursh, Fl. Amer. Sept. 1816, ii. 397 = S. lancifolia, L. (teste Engelmann in A. Gray, Man. Bot. ed. 5, 1867, 493).

S. gracilis, Pursh, Fl. Amer. Sept. 1816, ii. 396 = S. variabilis, Engelm. var. angustifolia (Engelmann in A. Gray, Man. Bot. ed. 2, 1856, 439).

S. graminea, Michx. Fl. Bor. Amer. 1803, ii. 190.

S. graminea, Nutt. = Sag. stolonifera, Eng. et Gray (testibus G. Engelmann et Asa Gray, Plantæ Lindheimerianæ in Boston Journ. Nat. Hist. 1845, v. 234 = S. graminea, Michx. (Engelmann in litt. d. d. Junio, 1867).

S. graminea, Michx. var. platyphylla, Eng. in A. Gray, Man. Bot. ed. 5, 1867, 494.

S. Guayanensis, H. B. K. Nov. Gen. et Sp. Plant. 1815, i. 250 = Alisma echinocarpum, Seub. = Echinodorus Guianensis, Griseb.

S. hastata, D. Don, Prod. Fl. Nepal. 1825, 22.

S. hastata, Pursh, Fl. Am. Sept. 1816, ii. 396 = S. variabilis, var. sagittifolia, Eng.

S. heterophylla, Pursh, l. c.

S. heterophylla, Pursh, var. angustifolia, Eng. in A. Gray, Man. Bot. 1856, ed. 2, 439.

S. heterophylla, Pursh, var. elliptica, Eng. l. c.

S. heterophylla, Pursh, var. rigida (Pursh, als Art), Eng. l. c.

S. heterophylla, Berter. mihi ignota = S. incrassata, Steud. (teste Steudel).

S. heterophylla, Schreb. in Schweigger et Körte, Fl. Erlang. 1811, ii. 119 = S. sagittifolia, var. heterophylla, Bll.

S. hirundinacea, Bl. Enum. Plant. Javæ, 1830, fasc. i. 34.

S. incrassata, Steudel, Nomencl. Bot. ed. 2, 1841, ii. 491.

S. lancifolia, L. Syst. Nat. ed. 10, 1759, ii.

S. lancifolia, var. angustifolia, Lindl. (als Art), Griseb. Cat. Pl. Cuben. 1866, 218.

S. Lappula, D. Don, Prod. Fl. Nepal. 1825, 22.

S. latifolia, Willd. Linn. Sp. Plant. ed. 4, 1805, iv. 409 = S. variabilis, var. latifolia, Eng.

S. latifolia, β. major, Pursh, Fl. Amer. Sept. 1816, ii. 396 = S. variabilis, var. latifolia, Eng.

S. longiloba, Eng. apud J. Torrey in Emory, U.S. et Mex. Bound. Surv. 1859, ii. 212; aff. S. gramineæ, Michx.; an diversa?

S. macrophylla, Bunge, Enum. Plant. quas in China Bor. coll. anno 1831, in Mém. Sav. Étrang. 1832, ii. 137 = S. edulis, Schlecht.

S. macrophylla, Zucc. Plant. Nov. et minus cogn. quæ in Hto. Bot. Herbarioque Regio Monacensi servantur fasc. 1, in Abhandl. der Königl. Bayr. Akademie, 1832, i. 289 = S. Mexicana, Steudel.

S. major.

S. Mexicana, Steud. Nomencl. Bot. ed. 2, 1841, ii. 491, v. S. macrophylla, Zuccar.

S. minor, Mill. Dict. ed. Germ. a me visa; Ph. Miller, Allgemeines Gärtnerlexikon, nach der Engl. 8. Aufl. übersetzt; Nürnberg, 1776, iv. 35 = S. sagittifolia, L. (foliis sagittatis, spathulatisque).

S. minor, a cl. Pallas in descriptione S. natantis sine autore citata; quid est?

S. monoica, Gilib. Fl. Lith. 1781, v. 218 = S. sagittifolia, L.

S. Montevidensis, Cham. et Schl. Pl. Romanzoff. in Linnæa, 1827, ii. 156.

S. natans, Pall. Reise durch verschiedene Provinzen des Russischen Reiches, 1776, iii. Anhang, 757, t. G, f. 3 = S. alpina, Willd. = S. sagittifolia, L.

S. natans, H. Martius (rectius S. sagittifolia, var. natans), Prod. Fl. Mosquensis, ed. 2, 1817, 170.

S. natans, Michx. Fl. Bor. Amer. 1803, ii. 190.

S. natans, Michx. var. lorata, Chapm. Fl. South. U.S. 1865, 449.

S. nymphæfolia, Hochst. in Coll. Pl. Seneg. cl. Perrottet, n. 807 = Limnophyton obtusifolium, Miq.

S. nymphæfolia, Hochst. in Coll. Plant. Nub. cl. Kotschyi, n. 432 = S. cordifolia, Roxb. (v. Buchenau in Flora, 1865, 242).

S. obtusa, Mühlenberg;* Willdenow, Linn. Sp. Pl. ed. 4, 1805, iv. 409 = S. variabilis, var. obtusa, Eng.

S. obtusa, Thunb. Fl. Jap. 1784, 242 = S. obtusifolia, L. (teste Thunb. l. c.), probab. = S. sagittifolia, L. (teste Miq. Ann. Mus. Bot. Lugd. Bat. 1866, ii. 138).

S. obtusifolia, L. Sp. Plant. ed. 1, 1753 = Limnophyton obtusifolium, Miq.

S. obtusissima, Hassk. Cat. Hort. Bogoriens. 26 = S. triflora, Noronha. (Verh. Bat. Genootsch. v. 84, teste Hassk. Plant. Javan. Rariores, 1848, 104) = S. Blumei, Kunth.

S. ovata, Red. = S. lancifolia, L. (teste Grisebach, Fl. Brit. West Ind. Isl. 1864, 505).

S. palæfolia, Nees et Mart. in Maximilian, Prinz zu Neuwied, Beitrag zur Flora Brasiliens. in Nova Act. Phys. Med. Acad. Cæs. L. C. 1823, xi. 21.

S. papillosa, Buchen. Spec. Nov.

S. parviflora, Wall. Cat. = S. Blumei, Kunth (teste Miquel, Flora van Nederl. Ind. 1856, iii. 242).

S. plantaginifolia, Martens et Galeotti, Enum. Synopt. Plant. Phaner. ab H. Galeotti in region. Mex. coll. in

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* Non Willdenow, sed Mühlenberg. Willdenowius ipse dicit: Sagittaria obtusa Mühlenberg in litt.

Büll. Acad. Roy. Brux. 1842, ix. n. 2, 379.

S. pubescens, Muell. Cat. Plant. Amer. Sept. 1813, 8 = S. variabilis, var. pubescens, Eng.

S. pugioniformis, L. Diss. de Pl. Surin. 1775, n. 126; Amœn. Acad. 1783, viii. 263; in adn. S. acutifolia, Suppl. 419.

S. Purshii, Steud. Nomen. Bot. ed. 2, 1841; ii. 491; et Kunth, Enum. 1841, iii. 160 = S. acutifolia, Pursh.

S. pusilla, Blume, Enum. Pl. Jav. fasc. 1, 1830, 34 = S. Blumei, Kunth.

S. pusilla, Nutt. Gen. North. Amer. Pl. 1818, ii. 213.

S. pygmæa, Miq. Ann. Mus. Bot. Lugd.-Bat. 1866, ii. 138, an synon. S. pusillæ, Nutt.? (Miquel).

S. radicans, Nutt. Collections towards a Flora of Arkansas Territory in Trans. Amer. Philos. Soc. 1837, v. 159 = Echinodorus radicans, Eng.

S. ranunculoides. Arrab. (Velloz) Fl. Flumin. 1827, x. t. 32 = Hydrocleis nymphoides, Buchen.

S. rhombifolia, Cham. Spicilegium Alismacearum in Linnæa, 1835, x. 219.

S. rigida, Pursh, Fl. Amer. Sept. 1816, ii. 397 = S. heterophylla, var. rigida, Eng.

S. sagittata, Thunb. Fl. Jap. 1784, 242 = S. sagittifolia, L. (teste Thunb. ipso).

S. sagittifolia, Lour. Flora Cochinchin. 1790, ii. 570 = S. Chinensis, Sims (teste J. Sims, Bot. Mag. 1814, xxxix. 1631).

S. sagittifolia, L. Sp. Plant. ed. 1, 1753.

S. sagittifolia, Rich. Essai d'une Flore de l'Ile de Cuba, in Ramon de la Sagra, Histoire de l'Ile de Cuba, 1850, xi. 323 = S. acutifolia, L. (teste Griseb. in Cat. Plant. Cub. 1866, 218).

S. sagittifolia, Arrabida (Velloz), Fl. 1827, x. t. 32 = A. macrophyllum, Kunth (testibus Kunth, Enum. 1841, iii. 152, et Seubert in Endl. et Mart. Fl. Bras. 1847, fasc. viii. 108) = Echinodori sp.

S. sagittifolia, Auct. Amer. = S. variabilis, Eng.).

S. sagittifolia, b. æquiloba, Schur. Enum. Plant. Transsylv. 1866, 630.

S. sagittifolia, α. breviloba, Reg. Fl. Ussuri-Gebietes in Mém. Acad. St. Petersb. vii. sér. 1861, iv. n. 4, 140.

S. sagittifolia, c. divaricata, Schur. Enum. Plant. Transsylv. 1866, 630.

S. sagittifolia, α. edulis, Sieb. Herb. Miq. Ann. Bot. Lugd. Bat. 1866, ii. 138.

S. sagittifolia, α. heterophylla, Schur. Enum. Plant. Transsylv. 1866, 630.

S. sagittifolia, var. gracilis, Bll. (non Torrey!), Bolle, Alismaceenformen d. Mark in Verh. d. Bot. Vereins d. Mark, Brand. 1861, iii. 163.

S. sagittifolia, var. gracilis, Torr. compend. 355, teste Torrey ipso in Fl. of State of New York, 1843, ii. 259 = S. variabilis, var. gracilis, Eng.

S. sagittifolia, β. hastata, Torr. ibid. = S. variabilis, var. sagittifolia, Eng.

S. sagittifolia, var. heterophylla (Schreb. als Art), Bolle, Alismaceenformen der Mark in Verh. d. Bot. Vereins d. Mark Brand. 1861, iii. 161.

S. sagittifolia, α. latifolia, Torr. Compend. 355 teste Torrey ipso in Fl. of State of New York, 1843, ii. 259 = S. variabilis, var. latifolia, Eng.

S. sagittifolia, γ. longiloba, Turcz. Flora Baicalensi-dahurica in Bull. Soc. Nat. Mosc. 1854, iii. 57 = S. sagittifolia, var. angustifolia, Hook. Fl. Bor. Amer. ii. 167 (E. Regel, Flora des Ussuri-Gebietes in Mém. Acad. St. Petersb. vii. sér. 1861; iv. n. 140).

S. sagittifolia, var. macrophylla, Hook. Fl. Bor. Amer. 1840, ii. 167 = S. sagittifolia, var. latifolia, Torr. (teste J. Torrey, Fl. of State of New York, 1842, ii. 259 = S. variabilis, var. latifolia, Eng.)

S. sagittifolia, var. Mexicana, Martens et Galeotti, Enum. Synopt. Plant. Phan. ab H. Galeotti in region. Mexic. Coll. in Bull. Ac. Roy. Brux. 1812, ix. ii. 379 = S. variabilis, var. (?).

S. sagittifolia, β. minor, Pursh, Fl. Amer. Sept. 1816. ii. 395 = S. variablis, Eng.

S. sagittifolia, γ. minor, Reg. Flora des Ussuri-Gebietes in Mém. Acad. St. Petersb. vii. sér. 1861; iv. n. 4, 140.

S. sagittifolia, d. minor, Schur. Enum. Plant. Transsylv. 1866, 630.

S. sagittifolia, var. obtusa, Bolle, Alismaceenformen der Mark in Verh. d. Bot. Vereins d. Mark Brand. 1861, iii. 162.

S. sagittifolia, δ. pubescens, Torr. Compend. 355, teste Torrey ipso in Fl. of State of New York, 1843, ii. 259 = S. variabilis, var. pubescens, Eng.

S. sagittifolia, var. rigida, Torr. Fl. of State of New York, 1843, ii. 259 = S. rigida, Pursh. = S. heterophylla, var. rigida, Eng.

S. sagittifolia, var. simplex, Hook. Fl. Bor. Amer. 1840, ii. 167, teste Torrey (l. c.), qui synonyma: S. graminea, Pursh; S. simplex, Pursh; S. acutifolia, Pursh, enumerat. = S. graminea, Michx.

S. sagittifolia, var. stratiotoides, Bolle, Alismaceenformen der Mark in Verh. d. Bot. Vereins d. Mark Brand. 1861, iii. 164.

S. sagittifolia, var. subæquiloba, Regel, Fl. des Ussuri-Gebietes, 140; in Mém. Acad. St. Petersb. vii. sér. 1861, n. 4.

S. sagittifolia, var. vallisneriifolia, Cosson et Germ. in Grenier et Godron Fl. de France, 1855, iii. 167.

S. Sellowiana, Kunth, Enum. 1841, iii. 159 = S. acutifolia, L. var. (teste Miquel, Symbolæ ad floram Surinamensem in Linnæa, 1844, xviii. 379).

S. Seubertiana, Mart. in Endl. et Mart. Fl. Bras. 1847, viii. 110 = Echinodorus Guianensis, Griseb. (teste Griseb.).

S. simplex, Auct. Amer. (non Pursh). = S. graminea, Michx. (teste Engelmann in A. Gray, Man. Bot. ed. 5, 1867, 494).

S. simplex, Pursh, Fl. Amer. Sept. 1816, ii. 397 = S. variabilis, forma dioica, Eng. ibid.

S. Sinensis, Sims, Bot. Mag. t. 1631, April, 1814.

S. stolonifera, Eng. et Gray, Plantæ Lindheimerianæ in Boston Journ. Nat. Hist. 1845, v. 234 = S. simplex, Aut. Amer. = S. graminea, Michx. (G Eng. in litt. d. d. Junio, 1867).

S. triandra, Dalzell, Contrib. to Bot. of West. India in Hook. Journ. Bot. and Kew Garden Misc. 1850, ii. 144.

S. triflora, Noronha, Relatio Plantarum Javanensium iterfactione usque in Bandong recognitarum in Verh. Batav. Genootschap van Kunsten en Wetenschappen, 1791, v. 84 = S. Blumei, Kunth.

S. trifolia, L. Sp. Pl. ed. 1, 1753, species valde dubia.

S. variabilis, Eng. in A. Gray, Man. Bot. ed. 1, 1848, 461, et ed. 2, 1856, 439.

S. variabilis, var. angustifolia, Eng. l. c.

S. variabilis, var. diversifolia, Eng. l. c.

S. variabilis, var. gracilis, Eng. l. c.

S. variabilis, var. latifolia, Eng. l. c.

S. variabilis, var. obtusa, Eng. l. c.

S. variabilis, var. pubescens, Eng. in schedulis.

S. variabilis, var. sagittifolia, Eng. l. c.

S. vulgaris, Güldenst. Reisen durch Russland und in Kaukasischen Gebirge, 1791, ii. 45, 157 = S. sagittifolia, L.

Vallisneria, L. a cl. Munby in Catal. Plant. in Algeria Sponte Nasc. 1863, 32. Alismaceis adscribitur, sed certe genus Hydrocharitacearum est.

Vallisneria bulbosa, Poir. Lam. Encycl. Méthod. Bot. 1808, viii. 321, pro parte. = Sagittaria sagittifolia, β. vallisneriifolia, Coss. et Germ. pro parte verisimiliter = Scirpus maritimus, L.

JUNCAGINACEÆ, *Rich.*

(L. C. Richard, Analyse du Fruit, 1808, et Proposition d'une Nouvelle Famille des Plantes, les Butomées, in Mém. du Mus. 1815, i. 365.)

CATANTHES, L. C. Rich. l. c. = Tetronicum, Willd. (teste Kunth, Enum. 1841, iii. 142).

CYCNOGETON, Endl. Gen. Plant. Suppl. i. 1369.

C. Huegelii, Endl. Icon. Gen. Plant. 1838, t. 73; Stirpium australasicarum, Herb. Hüg. decad. iii. in Annalen des Wiener Museums, 1840, ii. 211 = C. procera, Buchen.

C. linearis, Sond. in Plant. Muellerianæ, Linnæa, 1856, xxviii. 225.

C. procera, Buchen. Triglochin procera, R. Br. Adnot. Triglochin dubia, R. Br., ad hoc genus referenda est; an diversa a specie præcedente?

HETEROSTYLUS, Hook. Fl. Bor. Am. 1840, ii. 171 = Lilæa, H. B. K. (teste Endl. Genera Pl. Suppl. i. 1356).

JUNCAGO, Tourn. Inst. Rei Herb. 1700, i. 260 = Triglochin, L.

J. palustris, Mönch, Methodus Plant. 1794, 644 = T. palustris, L.

LILÆA, H. et B. Plant. Équinoc. 1808, i. 222. Genus anomalum, ad Cyperaceas transferendum?

MAUNDIA, F. Muell. Fragm. Phytog. Austr. 1858, i. 22.

M. triglochinoides, F. Muell. l. c.

ORNITHOGALUM Japonicum, Buerger Herb. = Tr. maritimum, L.; Miq. Pro. Fl. Jap. in Ann. Mus. Lugd. Bat. 1866, ii. 139.

SCHEUCHZERIA, L. Syst. Nat. ed. 1, 1735 (teste Richter, Codex Bot. Linnæus) et Flora Lappon. 1737, 133.

S. Asiatica, Miq. Flora Nederl. Ind. 1856, iii. 243.

S. palustris, L. Sp. Plant. ed. 1, 1753; ed. 2, 1792, i. 482.

S. paniculata, Gilib. Exercitia Phytologica, 1792, ii. 502 = S. palustris, L.

S. unicapsularis, Commers. Herb = Juncus grandiflorus, L. Suppl. 209 teste Lamarck, Encyc. Méthod. Bot. 1789, iii. 266.

TETRONCIUM, Willd. Nähere Bestimmung einiger Liliengewächse im Magazin d. Gesellschaft Naturforschender Freunde in Berlin, 1808, ii. 17.

T. Magellanicum, Willd. ibid.

TRIGLOCHIN, Rivin, Locus mihi ignotus; Linn. Syst. Nat. ed. 1, 1735.

T. Ani, C. Koch, Beiträge zur Flora des Orients in Linnæa, 1849, xxii. 273 = T. maritima, L.

T. Atacamensis, Philippi, Reise durch die Wüste Atacama, 1860, n. 356, 49 [zweite Paginirung].

T. atlantica, Willd. Herb. = T. bulbosa, L. (teste Kunth, Enum. 1841, iii. 143.)

T. Barrelieri, Lois. Fl. Gall. 1807, 725, ed. 2, 1828; i. 264 = T. bulbosa, L.

T. bulbosa, L. Mantissa Plantarum Altera, 1771, 226.

T. bulbosa, β. robustior, R. et S. Linn. Syst. Plant. 1829, vii. ii. 1585.

T. (?) calcarata, Hook. Ic. Plant. 1842, v. t. 416.

T. calcitrapa, Hook. Ic. Plant. 1845, viii. t. 731.

T. centrocarpa, Hook. Ic. Plant. 1845, viii. t. 728.

T. Chilensis, Meyen, Reise um die Welt, 1834, i. 354, adnot. = T. palustris, L.

T. ciliata, Ruiz et Pav. Fl. Peruv. et Chil. 1802, iii. 52. An hujus generis?

T. decipiens, R. Br. Prod. Fl. Nov. Holl. 1810, 343 = T. striata, R. et P.

T. densiflora, Domb. in Herb. Mus. Paris = T. striata, R. et P.? (teste Kunth, Enum. 1841, iii. 144).

T. dubia, R. Br. Prod. Fl. Nov. Holl. 1810, 343. Species dubia, ad genus Cycnogeton referenda.

T. elata, Nutt. Gen. N. Amer. Plants, 1848, i. 237 = T. maritima, var. elata, A. Gray.

T. filifolia, Sieb. in Herb. Nov. Holl. n. 174; Spreng. Syst. Veg. curæ Posteriores, 1827, iv. 2, 142 = T. striata, R. et P.

T. filifolia, Hook. Ic. Plant. 1843, vi. t. 579 = T. triandra, Mich. (teste J. D. Hook. in Handb. N. Zeal. Fl. 1864, 278 = T. striata, R. et P.).

T. flaccida, A. Cunn. = T. triandra, Michx. (teste J. D. Hook. ibid.)

T. fonticola, Philippi, Reise durch die Wüste Atacama, 1860, n. 355, 7 [zweite Paginirung] = T. palustris, L.

T. juncea, Gilib. Exercitia Phytologica, 1792, ii. 501.

T. laxiflora, Guss. Ind. Sem. anni 1825 quæ ab horto regio in Boccadifalco pro mutua commutatione exhibentur, 1825.

T. Lechleri, Steud. in sched. W. Lechleri, Plant. Chilen. n. 457 = T. striata, R. et P.

T. linearis, Endl. in Plant. Preiss. 1846–7, ii. 54 = Cycnogeton linearis, Sond.

T. maritima, L. Sp. Plant. ed. 1, 1753, ed. 2, 1762, i. 483.

T. maritima, Thunb. Fl. Cap. 1807–1813, 340 = T. maritima, β. micrantha, E. M. (E. Mey. in Plant. Ecklonianæ, Linn. 1832, vii. 131) = T. striata, R. et P. (testibus Chamisso et Schlechtendal, Plant. Romanzoff. in Linn. 1827, ii. 150).

T. maritima, var. elata, A. Gr. Man. Bot. 1856, 437.

T. maritima, β. micrantha, E. Mey. Plant. Ecklon. Linn. 1832, vii. 131.

T. Mexicana, H. B. K., Kunth, Nov. Gen. et Sp. Plant. 1815, i. 244 = T. maritima, L.

T. Montevidensis, Spr. Linnæi, Systema Veg. ed. 14, cur. C. Sprengel, 1825, ii. 145 = T. striata, R. et P.

T. mucronata, R. Br. Prod. Fl. Nov. Holl. 1810, 343.

T. Neesii, Endl. in Pl. Preiss. 1846–47, ii. 54 = T. mucronata, R. Br. (teste Sond. in Pl. Muell. Linn. 1856, xxviii. 224).

T. nana, F. Mueller, Desc. Austral. Plants in Hook. Journ. Bot. 1856, 332.

T. palustris, L. Sp. Plant. ed. 1, 1753, ed. 2, 1762, i. 482.

T. palustris, Brot. Fl. Lusitan. 1804, 600 = T. bulbosa, L. (teste Kunth, Enum. 1841, iii. 143).

T. palustris, Desf. Fl. Atlant. 1798, i. 322 = T. laxiflora, Guss. (teste Gussone, Fl. Sicul. Synop. 1842, i. 439).

T. palustris, β. L. Sp. Plant. ed. 2, 1762, i. 483 = T. bulbosa, L.

T. palustris, β. salina, Mertens et Koch, Deutschlands Flora, 1826, ii. 628.

T. palustris, β. Poll. Hist. Plant. in Palat. Elect. Sponte Nasc. 1776, i. 368 = T. palustris, β. salina, M. et K. (testibus Mertens et Koch, l. c.)

T. patens, Steud. Herb. = T. bulbosa, L. β. robustior, R. et S. (testibus Römer et Schultes, l. c.)

T. procera, R. Br. Prod. Fl. Nov. Holl. 1810, i. 343 = Cycnogeton procera, Buchen.

T. racemosa, Endl. Plant. Preiss. 1846–47, ii. 54 = Antherici semibarbati, R. Br. (Prod. Fl. Nov. Holl. 1810, 275) status nondum evolutus, teste Sonder in Pl. Mueller. (Linn. 1856, xxviii. 224).

T. reflexum, Vahl, nomen ab auctore

non publicatum = Tetroncium Magellanicum, Willd. (teste Willd. in Magazin d. Gesellschaft naturforschender Freunde in Berlin, 1808, ii. 17).

T. Rœgneri, C. Koch, Beiträge zur Flora des Orients; Linn. 1849, xxii. 272, an T. maritimæ, var?

T. salina, Wallr. Scholion zu Hampe's Prod. Fl. Hercyniæ in Linn. 1840, xiv. 567 = T. maritima, L.

T. striata, R. et P. Fl. Peruv. et Chil. 1802, iii. 72.

T. triandra, Michx. Fl. Bor. Amer. 1803, i. 208.

T. trichophora, Nees ab Esenb. in Pl. Preiss. 1846–1847, ii. 54.

NEW BRITISH LICHENS.

By the Rev. James Crombie, M.A., F.G.S., F.L.S.

No. III.

In addition to those enumerated in the two former papers, there are now to be described the following *new* species recently discovered by me in the New Forest and in Scotland, one of which, however, had previously been recorded by Mr. Mudd.

1. *Lecidea tenera*, Nyl. in Flora, 1869, p. 83; thallus cinereous-green, thin, somewhat subgranulate, indeterminate, everywhere rimulose; apothecia pale, minute, plane, with paler margin; spores 8 in thecæ, colourless, oblong or subbacillar, simple or obsoletely 1-septate, 0·008–0·10 mm. long, 0·0015–0·0025 mm. thick; paraphyses moderately thickish, with clavate apex, epithecium and hypothecium colourless; hymeneal gelatine blue with iodine, spermogones colourless, spermatia oblong.

On the smooth face of a granitic rock on the coast of Kincardineshire, S. of the Bay of Nigg. August, 1868. Though occurring plentifully in one spot, it was seen by me nowhere else in the neighbourhood. It is allied to *L. globulosa*, Flk., from which it is sufficiently distinguished by the above characteristics.

2. *L. præcavenda*, Nyl. in litt.; thallus obscure, thin, scarcely visible; apothecia black, plane or somewhat concave, margined, small; spores 8 in thecæ, faintly blackish, elliptical, 1-septate, 0·014–17 mm. long, 0·006–8 mm. thick; paraphyses slender, epithecium obscurely amber-brown, hypothecium somewhat reddish-brown, above more intense in colour; hymeneal gelatine blue, and then wine-red with iodine.

On the decaying wood of an old holly near Lyndhurst in the New Forest. April, 1869. Very rare and local, and found only very sparingly on a single tree. Nylander observes that it is distinguished from *L. myriocarpa*, De Cand., by the form of the paraphyses and the reaction with iodine, and from *L. adpressa*, Hepp., by the paraphyses and the colour of the spores and hypothecium.

3. *L. deducta*, Nyl. in litt.; thallus obscurely subgelatinous, but scarcely proper (as traces of a greenish effuse thallus are here and there visible); apothecia blackish, small, usually margined; spores 8 in thecæ, colourless or faintly blackish, elliptical or oblong, 3-septate, 0·010–13 mm. long, 0·0035–0·0045 mm. thick; paraphyses not discrete, thin layer of the apothecia reddish (hypothecium more obscure in the middle); hymeneal gelatine blue, then wine-red with iodine.

On decaying felled stumps of Holly in the New Forest, near to Brockenhurst. April, 1869. Very rare, and perhaps but a variety of *L. subturgidula*, Nyl., from which it differs chiefly by the apothecia being black and margined.

4. *L. spododes*, Nyl. in litt.; thallus greenish-yellow, thin, granulose, somewhat evanescent; apothecia cinereous or sordid pale, small, convex, immarginate; spores simple, oblong, 0·010–14 mm. long, 0·0025–0·0040 mm. thick; hymeneal gelatine blue, and then wine-red with iodine.

On old pales near Lyndhurst in the New Forest. April, 1869. Rare and local. It is closely allied to *L. denigrata*, Frs., of which probably it is to be regarded as a subspecies, though externally it is readily distinguished from this.

5. *Endocarpon Crombiei*, Mudd, Brit. Clad. p. 36; parasitic on thallus of *Thamnolia vermicularis;* apothecia verrucæform, lateral minute, at length emersed, confluent, each verruca containing many nuclei; ostiola very minute, punctiform, depressed, pale reddish-brown; nucleus subgelatinous in yellowish-brown subceraceous tunic; paraphyses slender, discrete; spores 8 in thecæ, very minute, elliptical, unilocular, occasionally obscurely bilocular, hyaline.

Apparently not very rare on the higher Grampians of Scotland, as Ben Lawers, Morrone, Ben-na-boord, on which last mountain it was first discovered by me in August, 1862. Though regarded by Mudd, l. c., as a true lichen, Nylander considers it as a *fungillus,* and indeed

it seems to be one of those anomalous things of which the systematic place is at present rather doubtful.

I may here also mention that *Collema chalazanodes*, Nyl. in Flora, 1869, p. 293, has been gathered in Bradley Wood, Devon, by Dr. H. B. Holl, whose herbarium contains several lichens not hitherto recorded as British, which will be duly noticed in my forthcoming 'Enumeration of British Lichens.'

NOTES ON THE FERN-FLORA OF CHINA.

By H. F. Hance, Ph.D., etc.

At page 270 of the last volume of this Journal, Dr. Max Kuhn, of Berlin, notices, under the name of *Woodsia macrochlæna*, a supposed new Fern, collected at Che-foo by the botanists of the Prussian expedition to China. Dr. Kuhn has since had the kindness to transmit to me a small specimen of this, an examination of which enables me to state positively that it is identical with my *Woodsia insularis*, described eight years ago (Ann. Sc. Nat. 4, sér. xv. 228) from two or three plants only, gathered in the island of Sachalin. Dr. Kuhn remarks, "differt ab omnibus reliquis speciebus indusio membranaceo quadrifido, lobis margine longissime ciliatis persistente." It seems to have escaped him that *W. polystichoïdes*, Eaton, figured by the late Sir W. Hooker at plate 2 of his 'Second Century of Ferns' and plate 32 of his 'Garden Ferns,' is described as "involucro e squamis 4–5 tenui-membranaceis in orbem dispositis imbricatis longe ciliatis;" and by Milde (Fil. Europæ, etc., p. 170), from the figure only, as having "indusium profunde quadripartitum, margine longe ciliatum." Of the varieties *nudiuscula* and *sinuata* of this latter species I possess good examples from northern China, as also of *W. Ilvensis*, R. Br., and *W. hyperborea*, R. Br. The sections into which this genus is divided by various pteridologists do not seem to me tenable.

In the article referred to, Dr. Kuhn quotes my notice of *Adiantum Cantoniense* in a way which would be likely to lead an ordinary reader to infer that I had maintained this as a species, and that he had first established its identity with *A. Capillus-Junonis*, Rupr. This is not the case, as my paper, published a year before his own, had for its sole object to point out this identity. Dr. Kuhn regards the southern Fern

as a variety distinct from the northern one, relying, as I learn from him by letter, on the circumstance that in the former the transverse diameter of the pinnule is greater than the longitudinal, whilst in the latter the reverse is the case. But the considerable number of specimens from both parts of the empire which I have been enabled to compare conclusively prove the instability of this character, and that it is not possible to distinguish two well-defined forms.

Adiantum diaphanum, Bl., which, though very close to, is yet, I think, scarcely identical with *A. setulosum*, J. Sm., is abundant at Amoy, growing in wells, and on the shaded perpendicular sides of ditches.

Though I have seen no Indian specimens, I think it most probable that my *Adiantum Guilelmi* must be merged in *A. Edgeworthii*, Hook., to which, judging from the character only, I had approximated it: a specimen from Père David has the rachis conspicuously flagelliferous, whilst specimens of *A. Capillus-Junonis* differ equally in the absence or presence of this naked rooting prolongation. What further disposes me to this conclusion is, that I have received from the same excellent naturalist, gathered on shaded rocks of the mountains of northern China, two other plants hitherto supposed to be peculiar to India,—and there, I believe, local,—viz. *Didymocarpus lanuginosa*, Wall., and *Gymnogramme vestita*, Hook. This Fern is surely most distinct from *A. caudatum*, L., with which both it and *A. rhizophorum*, Swz. (also, as I think, a true species), are combined by Mr. Baker in the 'Synopsis.'

Adiantum Capillus-Veneris, L., is common in various places in the Canton province, but always, so far as I have observed, under the ordinary form, not the one with deeply incised pinnules met with in Ceylon and elsewhere.

Cheilanthes ? Chusana, Hook., was sent me from Foochow by Mr. Medhurst in 1859, and Messrs. Parry, Sampson, and I have met with it in various localities in Kwangtung. I cannot help thinking that my determination of this plant is correct, and the late Professor Mettenius was of the same opinion. It often accords quite well with the figure (Spec. Fil. 2. t. 106 B), but the pinnæ are frequently less approximate and the pinnules broader. Sir William Hooker, to whom on two several occasions I sent specimens, first said it was a broad form of *C. tenuifolia*, Swz., afterwards that he considered it to be his *C. subvillosa*. That, however, it cannot be, since it has neither the continuous invo-

lucre nor the villose pinnæ which are attributed to that Fern both in the description and figure.

Father Armand David discovered *Cheilanthus tenuifolia*, Sw., in shady places of the higher mountains in the neighbourhood of Peking. This Fern has not previously been recorded from Northern China, or from any part of Asiatic Russia; and I believe the Peking habitat is the most northerly known, answering to that of Tasmania in the southern hemisphere; which, though in a slightly higher latitude, and on about the corresponding isotherm, enjoys, from its insular character and the great preponderance of ocean, a far more equable climate and milder winter.

Mr. Sampson is, I believe, the discoverer of *Pellæa geraniifolia*, Fée, in Southern China; having, in September 1868, gathered unusually fine specimens on precipitous rocks, above the monastery, near the summit of the Pakwan hills, outside Canton.

The late Dr. Harland and I gathered, in October 1856, on the steep flanks of Victoria Peak, Hongkong, fine specimens of *Pteris pellucida*, Br., some of which were transmitted to Kew; but, though the species was determined by Sir William Hooker, the locality is omitted in the 'Synopsis.'

I find no plant in my herbarium answering to *Pteris insignis*, Mett., and there must be some mistake about the number, as my n. 79 is *Asplenium Klotzschii*, Mett. As its relationship to *P. tæniosa*, J. Sm., is mentioned, it is probable the Fern sent was regarded by me as not distinct from *P. cretica*, L.

Though I have seen no Javanese specimen, I have little doubt that Dr. Kuhn is right in reducing my *Woodwardia angustiloba* to *W. auriculata*, Bl.

Asplenium normale, Don, occurs in the dry clefts of rocks, on the summit of the White Cloud Mountains, above Canton, and I also gathered it on rocks in the Tsing-yune pass. Unless I err, this Fern has not previously been detected in China.

My *Asplenium comptum* (Ann. Sc. Nat. 5 sér. v. 255) is a Fern respecting which there is some difference of opinion amongst the most accomplished pteridologists. Sir W. Hooker (litt. 30 Jun. 1865) was uncertain whether it is distinct from *A. dimidiatum*, L., or a small form of *A. macrophyllum*, Sw. Professor Mettenius (litt. 31 Oct. 1865), after studying the Hookerian herbarium, regarded it as a remarkable

plant, to which he knew no parallel, and not nearly related to *A. dimidiatum*. Mr. Baker (litt. Feb. 1868) says it quite agrees with the African specimens referred to *A. dimidiatum* in the 'Synopsis Filicum.' Finally, Dr. Kuhn, who has recently redescribed it, under the impression that my name was only in manuscript, remarks (Botan. Zeit. 1869, p. 132): "Diese Art ist nahe verwandt mit *A. macrophyllum*, Sw., jedoch durch so wesentliche Merkmale von ihm verschieden, dass wir gegen eine Vereinigung gerechte Bedenken tragen würden." To me this Fern appears distinct from either of the species named, but, of the two, nearer *A. macrophyllum*.

Asplenium incisum, Thbg., to which *A. elegantulum*, Hook., is reduced by Mettenius (in Miq. Ann. Mus. Lugd.-Bat. ii. 234), Baker and Kuhn, is stated by Milde (Fil. Eur. 63) to be merely *A. Trichomanes*, L.

My *Asplenium Pekinense* is regarded as a good species by both Mettenius and Kuhn, but is referred by Baker (in litt.) to *A. sepulchrale*, Hook., which both Milde and Kuhn consider the same as *A. varians*, Hook. and Grev. The only specimen of *A. sepulchrale* I have seen, gathered by Oldham, and sent me under that name from Kew, but which exceeds the dimensions given in the 'Synopsis,' appears to me altogether distinct, by its habit (not unlike that of *Davallia tenuifolia*, Sw.) and very long stipes, and is apparently referable, or at least very close, to *A. solidum*, Kze.; and my Ceylon specimens of *A. varians* do not look at all as if belonging to the same species as either the Japanese or North Chinese Fern. I have, however, a small Jehol Fern from Père David, which I have no hesitation in referring to *A. varians*. Probably more plants than one have been confused under the name of *A. sepulchrale*. *A. Pekinense* is much like the American *A. montanum*, Willd.

Of *Asplenium Niponicum*, Mett., I possess Fokien specimens from De Grijs, and others gathered in the Filoitsz woods, along the North River, province of Kwangtung, by Sampson; they agree perfectly with those from Japan.

Mr. Swinhoe gathered the Japanese *Asplenium Gœringianum*, Mett., at Talienwan; and M. David has sent from Jehol a Fern which I cannot distinguish from *A. Hohenackerianum*, Kze.

Mr. J. G. Veitch gave me a Japanese specimen of *Asplenium Thwaitesii*, A. Br., which accords in the most perfect manner with those

from Ceylon. Neither Mettenius nor Baker have apparently ever seen this species from Japan.

Mr. Sampson has detected in shady parks at Canton an *Asplenium* in all respects identical with the Fern distributed from Ceylon under n. 1247 by Dr. Thwaites, by whom it is regarded as a bipinnate form of *A. Schkuhrii*, Mett.; whilst I cannot myself see how it is to be distinguished from the West Indian *A. radicans*, Schk.

I have received from Father Armand David specimens of *Scolopendrium Sibiricum*, Hook., gathered from cold alpine rocks near Jehol.

Aspidium devexum, Kze. (*intermedium*, J. Sm.) was found, in June 1865, along the West River, in the province of Canton, by Mr. Sampson. I give the above name and synonym on the authority of the late Professor Mettenius, to whom I sent a specimen, whose judgment with regard to Kunze's Ferns is unimpeachable, he having full access to that author's herbarium. Mr. Moore, also, from referring in his 'Index' both Kunze's and J. Smith's species to the variety *β* of his *Sagenia coadunata*, evidently considers them identical. The present is precisely the same as Dr. Thwaite's n. 1358, which Sir W. Hooker doubtfully regarded as a var. *β. minor* of *A. giganteum*, Bl., whilst he referred J. Smith's *intermedium* to the typical form of that species, and placed *A. devexum* as a synonym of *A. cicutarium*, Sw. Dr. Thwaites's n. 1357, again, which he considers, no doubt rightly, as the *A. giganteum* of the 'Species Filicum,' Professor Mettenius said is the *A. paradoxum* of Fée; whilst under the same number Gardner appears to have sent to Kew the very similar *A. membranifolium*, Mett., or *A. fuscipes*, Wall., with which latter name, indeed, my first specimen of *A. paradoxum* received from Dr. Thwaites was ticketed. This confusion in nomenclature renders it difficult to speak with certainty; but I believe *A. devexum* has only heretofore been found in Java, the Philippines, and Ceylon. An invaluable revision of some of the species of this exceptionably difficult genus, by the lamented Leipzig Professor, will be found in the Annales Mus. Lugd.-Bat. i. 225, *seq.*

Mr. Sampson gathered beautiful specimens of *Aspidium odoratum*, Bory, on the singular isolated limestone rock called Kai-kun-shek, or 'Cock's-comb-hill,' along the West River, 100 miles west of Canton, in June 1864, and others in the caverns at Sai-chii-shan, in February, 1869. Milde records the species from China, on the authority of the Petersburg herbarium, therefore, perhaps, from the north of the empire.

Mr. Baker's mention of this country was, I believe, in reference to my own specimen.

I may take this opportunity of remarking, in connection with my former observations on the coalescence of tribes (Journ. Bot. Vol. III. p. 342), that a very marked transition is effected between the genera *Asplenium* and *Aspidium*, by such species as *Asplenium gymnogrammoides*, Kl., and *A. puncticaule*, var. *bipinnatisecta*, Mett. (= *A. macrocarpum*, Bl.) on the one hand, and *Aspidium splendens*, Wall., and *A. obtusissimum*, Mett.! (= *A. sparsum*, *β. latum*, Thw. n. 1369!) on the other; and, again, through *Asplenium Gæringianum*, Mett., *A. Hohenackerianum*, Kze., and their allies, and *Aspidium æmulum*, Sw. I think it is difficult to look at these representatives of their respective genera without believing them to be really allied, not merely somewhat alike. The true position of *Athyrium*, in so far at least as regards some of the species, seems to me still very much open to question; and Milde insists strongly on its distinctness as a genus.

Dr. Wells Williams gathered at Ku-pei-kau, in the summer of 1865, from fissures in the bricks of the Great Wall, a curious dwarf variety of *Polypodium lingua*, Sw., with oblong fronds ¾ to 1 inch long only, borne on stipites of nearly equal length.

With respect to *Polypodium Chinense*, Mett., separated from *P. normale*, Don, mainly on account of a more complicated venation, and the absence of paraphyses, I may remark that *P. normale* is placed by Mettenius himself, in his monograph of *Polypodium* ('Dispositio Specierum,' p. 24), in a section to which he ascribes "sori paraphysibus destituti;" nor are any figured in Hooker and Greville's plate of *P. longifrons*, Wall. (Ic. Fil. i. t. 65). The only Indian (Khasia) specimen of *P. normale*, to which I have at present access, has the sori too much rubbed and defaced, from careless drying, to be trustworthy on this point; but, so far as concerns the venation, I can see no appreciable difference between it and the Chinese Fern (Macao, Hance! Fokien, De Grijs!), the number of free thickened veinlets in the areolæ being subject to a good deal of variation in the fronds of each.

The late Mr. Oldham sent me, from Formosa, a fine specimen of *Polypodium lomarioïdes*, Kze., quite accordant with those from the Philippines.

ON A NEW SPECIES OF HYPODERRIS.

By Charles Prentice, Esq.

While examining a portion of the fern herbarium at the British Museum a few days since, I met with what seems undoubtedly a second unnamed species of the rare genus *Hypoderris*, R. Br. It was recently (1867) brought from Nicaragua by Dr. Seemann, and proposing to name it after the discoverer, I send a description and diagnosis.

Hypoderris Seemanni, mihi. Rhizome short, woody, sending out several rather stout, filiform radicles; stipes from six inches to a foot high, brown, with a few jagged, dark brown, narrow scales at the base, otherwise quite smooth, with the exception of a scattered scale here and there; frond lanceolate, pinnatifid almost to the rachis, along which it is decurrent, entire or slightly pinnatifid at the summit; smooth; sori principally arranged in an intramarginal series, a few only being scattered over the under surface of the frond; fertile divisions of the frond narrower than the barren ones.—Chontales Mountains, Republic of Nicaragua (Seemann! n. 206.)

As in *H. Brownii*, the frond is finely cellular under a lens, and the peculiar venation is the same in both species; but the smooth stipes, the lanceolate, deeply pinnatifid frond, and the arrangement of the sori, which are scattered equally over the whole under surface of the frond of *H. Brownii*, constitute a sufficient specific distinction.

TRANSPORTATION OF SEEDS.

A correspondent from the Philippine Islands writes to us:—I received a box that had been dispatched from Berlin in February, 1859, by overland mail, *viâ* Trieste, but got lost during the Italian war, and only reached me after sixteen months. It was a large box lined with tin, carefully soldered; among its contents were two small glass-stoppered bottles, the one filled with moist charcoal-powder, the other with moist clay; each contained some bulbs of red hybrid *Nymphaceæ*, from the Royal Botanical Garden in Berlin. Those packed in charcoal were spoilt, but two of the four in moist earth had germs

$\frac{1}{6}$ inch long. I planted them at once in cocoa-nut shells; they began to sprout almost immediately, grew very vigorously, and soon produced flowers.

Luzon, province Albay.

NEW PUBLICATIONS.

The Quinology of the East Indian Plantations. By JOHN ELIOT HOWARD, F.L.S., F.R.M.S., F.R.H.S., Member of the Pharmaceutical Society of Great Britain, and of the Botanical Society of France, etc. London: L. Reeve and Co. 1869. Pp. x. 44, with three coloured Plates by Tuffen West.

Seven years have elapsed since the appearance of Mr. Howard's 'Nueva Quinologia of Pavon,' and now we have the above work fully sustaining the author's reputation as an accomplished chemist and botanist. Mr. Howard is one of those lovers of science, unfortunately by no means numerous, who stick with persevering zeal to the investigation of a particular branch of inquiry with a view to its elucidation; and in the present instance, such has been the application of our author that he is justly considered to be one of the greatest quinologists living. Would that others would produce such valuable monographs on little-known subjects! and the result would help to render economic botany less perplexing to the student than it now is.

The present work treats on the result of the acclimatization of the *Cinchonæ* in India, under Mr. M'Ivor, who is as successful a cultivator as Mr. Broughton is a quinologist. Mr. Howard well observes of these gentlemen, "The Indian Government have been fortunate in the choice of servants to whom the practical carrying out of the details of this great scheme has been confided, and I am glad to think in this most recent instance they have been equally successful."

The work consists of four parts. 1. Microscopical Observations on the Plates; 2. Chemical and Microscopical Investigations; 3. Appendix; 4. Addenda et Corrigenda.

In the 'Microscopical Observations' we have some remarks on the structure of those barks which have been "renewed," and having an important bearing on physiological botany. The plates, for the ac-

curacy of which Mr. Tuffen West's name is a sufficient guarantee, follow next. The difference in microscopic structure (plate i.) of bark grown in sunshine and in shade (the latter condition favouring suberous growth), and under moss and in the open garden, is very remarkable. In plate ii. there are figures of the microscopical structure of those barks which have been "renewed" by "mossing." Plate iii. (fig. 8) is very curious, being representations of *scalariform* tissue found in renewed bark.

In the 'Chemical and Microscopical Observations,' which is really the body of the work, we have much useful information. Under the head of "Elevation above the sea level," some notes of the greatest practical importance to the cultivator occur, from which it appears that it is useless to attempt the cultivation of these plants at a lower level than 4000 feet above the sea. As affecting the whole question of acclimatization in the Neilgherries, the analyses of four specimens of bark are not to be lost sight of. Some seeds and bark of *Cinchona officinalis*, L., were received by Mr. Howard from Uritusinga (Peru), the total yield of alkaloid being 3·11 per cent.

From these seeds, plants were raised in England the bark of which yielded 1·93 per cent. Mr. Howard then gave a living plant, 6 feet high, to the Indian Government, which, after losing its leaves in the passage out by sunstroke and partly recovering in India, yielded 2·36 per cent., while plants raised from it in India yielded 3·33 per cent.

The "effect of sunlight" favours "the production of cinchonidine and dense shade that of cinchonine, whilst it appears from other observations for quinine, that the leaves should be well exposed to light, whilst the stem bark is shaded from the direct action of the sun."

As a commercial question of great interest, we learn with satisfaction that the first importations of bark (*Cinchona succirubra*, Pavon) to England from India, have met with great favour, giving, by analysis, 6·8 per cent. of alkaloidal contents; and, in the case of Ceylon, the remittance of the bark of *C. officinalis* and *succirubra*, though only of three years' growth, and consequently immature, fetched a higher price than South American bark of the same species.

A great deal of the remunerative success of the undertaking depends on "mossing the bark," and we may remark with Mr. Howard in his "Conclusion," that Mr. M'Ivor's plan of mossing is an important dis-

covery in the direction of intelligent culture. The process is thus described by Mr. M'Ivor:—

> "In removing the strip of bark, two parallel cuts should be made down the stem, at the distance apart of the intended width of the strip of bark; this done, the bark is raised from the sides of the cut and drawn off, beginning from the bottom, care being taken not to injure the sappy matter or Cambium left on the stem of the tree. This Cambium or sappy matter immediately granulates on the removal of the bark, and, being covered, forms a new bark, which maintains the circulation undisturbed."

This moss is kept continually moist, and, as in the case of the best native bark, lichens cover them, thus being taken as a criterion of goodness by the "Cascarilleros," so the presence of the moss keeps the bark from direct sunlight, and thus preventing the oxidation of the alkaloids and the elaboration of a troublous resin. From this it may be seen that it is not only wasteful but useless labour to cut down the tree in order to obtain the bark, and that killing the goose to possess the golden egg is no longer necessary.

There are many other subjects we would like to note as the researches of the author, together with those of Decaisne, Trecul, Berg, etc., on physiological questions of vast importance on the Cambium, mode and origin of the "renewed" bark, course of the sap, etc., but space bids us draw this notice to a close. Even the leaves of the tree are useful in fresh infusions or decoctions for the fevers of the country.

The appendix and addenda contain correspondence with the Under-Secretary of State, Dr. De Vrij, etc., and other useful selections.

In conclusion, it is seen that careful attention to climatological requirements and careful selection of the best species, have *at least* rendered the barks in value fully equal to those of South American growth, and even more so, as appears from a recent number of the 'Pharmaceutical Journal,' in which a case of a bark is mentioned yielding 10 per cent.

At p. 30 the author conveniently sums up the conclusions which he has arrived at, and with more or less clearness succeeded in demonstrating, viz.:—

1. That the cultivation of the Cinchonæ in India promises complete success, but to ensure this, great attention must be paid to the choice of species.

2. That if properly conducted, it will prove remunerative.

3. That Mr. M'Ivor's plan of mossing is an important discovery in the direction of intelligent culture.

4. That the renewal of the bark from the cambium leads to different conclusions as to the permanence of the supply of fresh bark, from those to be deduced from the theory of formation of the alkaloids in the leaves.

5. That no part of the tree—root, stem, or leaves—visited by the ascending sap, seems to be the place of deposit of the alkaloids.

6. That these are formed in the cellular tissue of the bark, beginning from the cambium outwards.

7. That the sources whence the materials are drawn for this elaboration are at once the nourishing sap descending in its usual course, and a lateral conveyance, through the medullary rays, of part of the deposit of the mother-substance in the wood.

8. That inasmuch as this mother-substance is characteristic of the Cinchonæ, and is the source of the Cinchona-red, it may also mainly conduce to the formation of the alkaloids, since it is probable that the characteristic principle of each plant is originally *one.*

9. That the above principle, deduced by M. Decaisne from his researches on Madder, is equally true as to Red bark.

10. That no explanation is at present offered of the tendency of the cells in the root of the Madder to secrete the peculiar colouring-matter, nor in the bark of the Cinchonæ to produce alkaloid.

11. That the electro-chemical properties of the cells are nevertheless greatly influenced by the respiration, and that by changing the character of this respiration we may artificially control their action.

12. That the *chlorophyllian* respiration does not favour, but that the *general* respiration does favour the production of alkaloids.

13. That the presence or absence of light has a great influence (through the respiration) on all the above phenomena.

14. That the laticiferous ducts dwindle and disappear coincidently with the formation of the alkaloids.

15. That the liber fibres are not the place of deposit of the alkaloids.

Mr. Howard remarks that the re-establishment of the bark under this treatment of mossing is *perfect.* "I compared this at first" (he says)—as indeed the first specimens sent seemed to justify—"to the granulation of flesh over the surface of wounds; but the accompanying drawings, under the microscope, show the bark in the third time of renewal to be perfectly renewed, as is the case in the parts replaced by animals of low organization, as the claw, for instance, is formed again after being lost by the lobster."

Die Lemnaceen. Eine monographische Untersuchung. Von Dr. FRIEDERICH HEGELMAIER. (*The Lemnaceæ; a Monograph.* By Dr. F. Hegelmaier.) 4to. With 16 plates. 170 pp. Leipzig: Wilhelm Engelmann. 1868.

This monograph has long been looked for, and is a most creditable performance, Dr. Hegelmaier having spared no pains to make it perfect in every way his means and resources would admit. His attention was first directed to the Order by the *Lemnaceæ* collected in tropical Africa by that indefatigable and zealous collector, Dr. Welwitsch, being entrusted to him for critical examination. The result of this examination was published in this Journal, and not only prompted Dr. Hegelmaier to pursue the subject further until he had exhausted it as far as his present materials would allow, but also induced others to follow his meritorious example, and to confide the result of their labours to our care for publication. The history of this monograph is an apt illustration how British and foreign botany act and react upon each other. Some of our local botanists probably did not thank us when we filled up a whole plate and a considerable number of pages of our Journal with dry technicalities about *African* Lemnaceæ, and yet to the publication of these they owe indirectly the discovery of a genus of Phanerogams absolutely new to the British Flora,—we mean *Wolffia*.

Dr. Hegelmaier rejects the opinion of those who incorporate the *Lemnaceæ* with the *Pistiaceæ* (which is undoubtedly a group of *Aroideæ*, closely connected with the rest of the Order through the genus *Ambrosinia*), and finds a better systematic position for them near *Zosteraceæ*, which must either be altogether united with the *Najadeæ*, or be placed in their immediate vicinity. The *Lemnaceæ* represent the lowest type of flowering plants, *Lemna Columbiana*, Karst., being the most simple, *Spirodela polyrrhiza*, Schleid., the most complex organism of the group.

Dr. Hegelmaier enters into full details about the anatomical structure and morphology of the *Lemnaceæ*, illustrating his views and observations by carefully-drawn plates, and concludes with a systematic enumeration of all known genera, species, and varieties of this ill-understood Order of plants. Altogether Dr. Hegelmaier enumerates 3 genera and 21 species, viz.:—

Tribus I.—**Wolffieæ.**

I. Genus Wolffia, *Horkel.*

I. Subgenus *Euwolffia.*

1. *W. Columbiana*, Karsten.
2. *W. cylindracea*, Welw.
3. *W. arrhiza*, Wimm.
4. *W. Brasiliensis*, Weddl.
5. *W. microscopica*, Kurz.
6. *W. hyalina*, Delil.
7. *W. repanda*, Hegelm.
8. *W. Welwitschii*, Hegelm.

II. Subgenus *Wolffiella.*

9. *W. oblonga*, Hegelm.
10. *W. ligulata*, Hegelm.
11. *W. gladiata*, Hegelm.
12. *W. denticulata*, Hegelm.

Tribus II.—**Lemneæ.**

II. Genus Lemna, *L.*

I. Subgenus *Hydrophace.*

1. *L. trisulca*, L.
2. *L. Valdiviana*, Philipp.
3. *L. perpusilla*, Torr.
4. *L. pauci-costata*, Hegelm.
5. *L. Angolensis*, Welw.
6. *L. minor*, L.

II. Subgenus *Telmatophace.*

7. *L. gibba*, L.

III. Genus Spirodela, *Schleid.*

1. *S. oligorrhiza*, Hegelm.
2. *S. polyrrhiza*, Schleid.

The author corrects an error of synonymy committed by Dr. Trimen with regard to *Wolffia Delilii*, Schleid., and also by Dr. Kurz in the various species he wrote on. But he seems himself to have made some blunders with regard to the West Indian species of *Wolffia*, for he seems

to class it with *W. Brasiliensis*, whilst Professor Grisebach (Fl. W. Ind. Islands, London, 1864, p. 512) has described it as a distinct species (omitted by our author), under the name of *W. punctata*. In quoting the English habitat of *W. arrhiza* we note two misprints. It should be *Staines*, Trimen, etc., p. 219, instead of Raines, Trimen, p. 21.

We should have been glad to see Latin generic and specific characters besides the German, and trust that, in any future monograph,—for the author, we are sure, will not drop the subject in its present state,—he will give them to us. We are also sorry to find that he has erred with Dr. Milde in his otherwise excellent monograph on *Equisetum*, in not giving us a complete index, so as to be able to find a synonym instantly, instead of having to search through the whole book for it.

The author fully discusses the geographical range of the different species. About one half of the species are common to the tropical and extratropical countries, the other half consists of species peculiar either to the tropics or extratropical parts. They are excluded from the Polar regions.

Dr. Hegelmaier thanks those botanists who, during his investigations, have supplied him with specimens, information, and suggestions; but now that he has shown what good use he has made of them, and what numerous blanks still remain to be filled up before we can say that our knowledge of this small, but interesting group of plants is complete,—he will probably receive considerable additions; and those botanists who should wish to make communications to him will be glad to know that any addressed to "Dr. Hegelmaier, Tübingen," will reach him.

BOTANICAL NEWS.

We rejoice to hear that Mr. Thiselton Dyer is a candidate for Dr. Lee's Readership in Anatomy, at Christ Church, Oxford, the duties of which are to give lectures on Biological subjects.

We have received full and authentic particulars respecting the share which Dr. Hooker is alleged to have had in preventing certain honourable distinctions being conferred upon some of the Englishmen who visited the great Horticultural Exhibition at St. Petersburg.

Dr. Seemann and Captain Bedford Pim, R.N., have just published, conjointly (Chapman and Hall), a book of travel in Nicaragua, Panama, and Mosquito, under the title of 'Dottings on the Roadside,' in which will be found some matter interesting to botanists.

We have received a copy of Prof. C. C. Babington's long-expected 'British Rubi,' on which we shall have occasion to speak at length. It is published by Mr. Van Voorst, but, unfortunately, at present without the plates, which we believe were placed in the hands of an artist notorious for delay. But as half a loaf is better than no bread at all, we are thankful that Prof. Babington has at least given us the letterpress.

Botanical Society of Edinburgh, *April* 8.—The following communications were read :—I. Notes on Range in Depth of Marine Algæ. By Professor Dickie (*vide* p. 148). II. Remarks on *Scirpus parvulus.* By A. G. More, Esq. III. Notes on the Varieties of Tea cultivated in India. By Mr. William Bell. IV. Notes on a Botanical Excursion to Shetland in 1868. By Alexander Craig-Christie, Esq. V. Notice of Plants Naturalized on the Banks of the Gala and Tweed. By Gilbert C. A. Stuart, Esq. Many of the plants referred to by the author are new to Scotland, most of them are rare even in England, and not a few of them are evidently entire strangers to Great Britain. Only one or two specimens of some could be found, but many of the others were abundant, and bore all the appearance of having established themselves. Among the plants mentioned in the paper were :—*Camelina sativa, Lepidium ruderale, Saponaria officinalis, Silene Anglica, Medicago maculata, Medicago denticulata, Lythrum hyssopifolium, Polycarpon tetraphyllum, Daucus gummifer, Caucalis daucoides, Erigeron acris, Centaurea solstitialis, Xanthium spinosum, Solanum nigrum, Amaranthus Blitum, Chenopodium murale, Rumex palustris, Cannabis sativa, Setaria viridis, Apera Spica-venti, Polypogon Monspeliensis, P. littoralis, Gastridium lendigerum, Festuca uniglumis*, and *Hordeum pratense.* He considers that the plants must have been introduced with the wool brought to the manufactories in the district. VI. On some British *Plantagines* allied to *Plantago maritima*, L. By Dr. Buchanan White. The author's attention was called to this genus of plants by the occurrence of a *Plantago* in great abundance in the interior of Ross-shire, and after careful examination of all the species belonging to the *P. maritima* group contained in the herbaria of the University of Edinburgh and the Botanical Society, he has come to the conclusion that instead of *P. maritima* being the only British representative of the group, there are altogether three species in Britain, viz., *P. alpina*, L., *P. maritima*, and *P. serpentina.* He concluded by giving descriptions of the different species. VII. Notice of some New and Rare British Mosses. By Mr. John Sadler. The first species referred to was *Grimmia anodon*, discovered for the first time in Britain on Arthur's Seat, in March last, by Mr. William Bell; second, *Didymodon luridus*, which had been gathered by James Fernie in March, and Mr. William Bell in April, in the neighbourhood of Edinburgh; third, *Pottia minutula*, found in considerable quantity in the Queen's Park, near the powder magazine. VIII. Report on the Open-air Vegetation in the Royal Botanic Garden. By Mr. M'Nab.

Vincent Brooks, Day & Son, Imp

NEW AND RARE BRITISH HYMENOMYCETOUS FUNGI.

By Worthington G. Smith, Esq., F.L.S.

(Plate XCV.)

The warm and showery spring of the present year was highly favourable to the growth of fungi. Many species appeared that had not been observed for years previously, and others that were either altogether new to science or new to Britain: of the species that came under my own observation I select the following for the 'Journal of Botany.'

A. (Flammula) decipiens, n. sp.; cæspitose; pileus 1 inch across, convex, fleshy, minutely squamulose, dry, rich brown, becoming pallid, umbo almost white; stem 2 in. high, often swollen, twisted, striate, attenuated downwards, rich tawny; gills crowded, moderately broad, truly decurrent, luminous brown; flesh within golden-yellow, bright brown at base; spores bright tawny, ring none.

On the 13th June of the present year I first found this curious species in Epping Forest; it was growing abundantly about burnt gorse stumps, on burnt earth and charcoal, in open places in the forest, in company with *A. (Flammula) carbonarius*, Fr. Like the last-named species, it is inclined to be fasciculate, and the groups of one and the other were so intimately mixed up and confused together that it was impossible to gather one without the other. Added to this, the pilei of the two species greatly resembled each other in colour, and the peculiar habitat on charcoal and burnt earth was the same. Owing to these deceptive peculiarities, and because Mr. Berkeley, to whom I sent specimens, believes it to be undescribed, I propose to describe it under the name of *Agaricus decipiens*. Though at a first glance it resembles *A. carbonarius*, it is on examination a totally different thing, as may be seen by referring to 'Journal of Botany,' Vol. VI. t. 75. It differs greatly in the attachment of the gills, for whilst they are adnate in *A. carbonarius*, which belongs to Fries' second section of *Flammula* (*Lubrici*), they are decurrent in the new species, which belongs to Fries' fourth section of *Flammula* (*Sapinei*), and is nearly allied to *Agaricus hybridus*, *picreus*, *sapineus*, etc.

A. (Tricholoma) brevipes, Bull.; Fries; Icon in Mus. Ac. Sc. Holm.

In terra humosa subnuda; in aggeribus Scaniæ vulgaris, Upsaliæ in hortis passim, at in silvatico-montanis nunquam vidimus. Stipes solidus, admodum rigidus, demum fibrosus, apice pruinatus, extus intusque fuscus. Ceterum admodum variabilis; interdum brevissimus, 2–3 lin. tantum altus et crassus, deorsum attenuatus; vulgo uncialis, nunc bulbosus, nunc æqualis, gracilior, ut in icone citata videre licet. Pileus carnosus, mollis, e convexo applanatus, lævis, glaber, udus (siccus opacus), 2 unc. circiter latus, ex umbrino expallens; sæpe glebis inquinatus. Caro pilei uda fuscescens, sicca albescens. Lamellæ emarginato-liberæ, confertæ, ventricosæ, ante marginem evanescentes, integerrimæ, albidæ. Mihi *A. arcuato* propior, quam sequenti. Affinitas inter *A. arcuatum*, *panæolum*, *grammopodium*, *melaleucum*, *humilem* (licet omnes antiquitus distinctæ sint) major est, quam inter alias Tricholomatum species; etiam *A. humilis* et *exscissus* ex horum fœdere. Omnes inodori.—Fries' 'Monographia Hymenomycetum Sueciæ.'

In June last the Rev. H. H. Gillett, of Waltham, Melton Mowbray, sent me a few specimens of the true *A. brevipes* of Bulliard, a species which he had found growing in abundance the previous October on an old heap of leaf-mould in a plantation, and in hedgerows by plantations. It is a most interesting addition to our flora, its place being near *A. humilis*, Fr. (the *A. blandus* of Berkeley in Eng. Fl.) and *A. subpulverulentus*, P.; it is, however, different from either, and, except in size, somewhat resembles *A. grammopodius*, Bull. Mr. Gillett informs me that last autumn he cooked and ate many specimens, and that he found them quite equal in flavour to *A. gambosus*, Fr.: to procure a spring crop he treated the heap of leaf-mould to a dressing of salt water in the way it is applied by Mr. Ingram (head gardener at Belvoir Castle) after his first crop of mushrooms is over, viz. a handful of salt to three gallons of water. This had the desired effect, and it gave me the opportunity of showing three or four specimens at one of the spring meetings of the Linnean Society.

The following species, some of which are very rare, have been met with during the last twelve months, and are worthy of record:—

A. (Omphalia) sphagnicola, Berk.; parasitic on sphagnum. Very wet places in bog; Wimbledon Common.

A. (Pleurotus) corticatus, Fr. Very large specimen on a branch of

an Apple-tree, branch 9 ft. from the ground, fungus 4 ft. 6 in. from the trunk. Staplehurst, Kent.

A. (Pleurotus) euosmus, Berk. This curious and little-known species has been most abundant about London and elsewhere this spring; in every instance that has come to my knowledge it has been found upon Elm. I saw it near Tottenham and other places, growing in abundance with *A. ostreatus*, Jacq., from which it is quite distinct. Its cartilaginous stem, tinted spores, and powerful aromatic odour, point rather to the genus *Lentinus* than *Agaricus*. On elm stumps, Mr. Broome's garden, Batheaston. Elm stumps, Street, Somerset, Mr. J. A. Clarke, who writes me to say it is esculent, and that he has repeatedly eaten it. In the account given of this plant by Dr. Badham, it is said to be dangerous.

A. (Pleurotus) salignus, Hoffm. Infesting dead Willow-trees side of New River, Stoke Newington, 1868, 1869.

A. (Pleurotus) atro-cæruleus, Fr. On a rotten stump. Bilton Wood, near Teignmouth, Devon; Mrs. Gulson.

A. (Panæolus) retirugis, Batsch. Common on cow-dung. Epping Forest, Feb. 1869. Pileus marked with prominent veins, very different from any other *Panæolus*.

Coprinus radians, Fr. This species I found growing luxuriantly May 22, 1869, on the damp, sloping ceiling in the scullery of the residence of my friend, G. Manville Fenn, Esq., Fyfield, near Ongar.

Lentinus tigrinus, Fr. I gathered several specimens of this rare plant, in company with my friend Mr. Broome, from a rotten, mossy trunk (probably Ash) in a pond at Fyfield, near Ongar, Essex. Spores white; smell disagreeable. May 22, 1869.

L. lepideus, Fr. This rare species of which I once found a single specimen near Tottenham, has appeared in several places this summer, and, with one exception, always *under railway bridges*. Dr. Chapman, of Abergavenny, found it growing *on* a railway bridge at that place in July; it came up through the roadway and its origin could not be ascertained from above. On Dr. M'Cullough examining the under side of the bridge he found thirty or forty specimens, all old and black from the smoke from the engines, growing from between the fir planking. Shortly after, the same species was found under four or five bridges about Abergavenny by Dr. Steele. On July 29, Dr. Bull found it growing at Hereford, "from between the timbers under-

T 2

neath a railway bridge." It was also found by Dr. Bull under a railway bridge at Leeds about a mile out on the Harrogate line. Some of the specimens sent on to me were very fine, exactly resembling Sowerby's figure (Eng. Fungi, t. 382), with curious abortive plants growing at the base; spores pale yellow, larger than the last.

Since the above lines were printed it has come up in the greatest abundance through brick earth, from railway sleepers, at the Kentish Town mouth of the Hampstead Heath tunnel of the North London Railway. I saw it from the carriage window, on August 9, as the train stopped at the Hampstead Heath station, so I got out and filled a large box with it. It was also found at Street, Somerset, habitat not stated.

Boletus variegatus, Fr. Fordingbridge, Hants, October, 1868. New Forest, near Lyndhurst, October, 1868. Mr. Broome.

B. æstivalis, Fr. Always common about Staplehurst, Kent, in the early summer.

B. viscidus, Fr. Common in same district in the autumn.

Hydnum gelatinosum, Scop. Fir trunk, Fordingbridge, Hants. Mr. J. A. Clark.

Sparassis crispa, Fr. Border of a fir wood near Fordingbridge, Hants. Mr. J. A. Clark.

Clavaria fumosa, P. Always in the autumn about Long Sutton, Hants.

EXPLANATION OF PLATE XCV.—Figs. 1 and 2, *Agaricus (Tricholoma) brevipes*, Bull. Fig. 3, section of ditto. Fig. 4, spores enlarged 700 diam. Figs. 5 and 6, *A. (Flammula) decipiens*, n. sp. Fig. 7, section of ditto. Fig. 8, spores enlarged 700 diam.

NOTES ON SOME COMPOSITÆ OF OTAGO, NEW ZEALAND.

BY W. LAUDER LINDSAY, M.D., F.R.S.E., F.L.S.

Some of the Otago *Compositæ* are handsome trees or shrubs, with abundant foliage and flower: and, especially under cultivation, most ornamental; decided acquisitions, therefore, to the shrubberies and gardens of settlers, and worthy of extensive introduction into Britain. Moreover the stem occasionally attains such dimensions that the timber becomes valuable, especially from the beauty of its markings, in cabinet-work. Some alpine or subalpine species of such genera as *Raoulia*,

Haastia, and *Celmisia*, have, in respect of the peculiar papery flowers, dry and bare, silvery or downy, stems, or thick, densely-woolly leaves and stems, much of the character of the so-called " Everlasting Flowers " of the Andes.

Buchanan reports species of *Leontodon*, *Hieracium*, and *Aster*, as occurring on hills of between 1000 and 2000 feet ; and species of *Chrysanthemum*—some of them very fragrant—on the higher ranges, at or above 4000 feet, where snow frequently falls or lies,—both in the south-eastern districts. But, according to the 'Handbook of the New Zealand Flora,' by Dr. Hooker, none of these genera occur at all in New Zealand, so that Buchanan has probably mistaken them for such genera as *Taraxacum*, *Microseris*, *Celmisia*, *Olearia*, *Vittadinia*, or *Senecio*.

Several genera (*e. g. Olearia*, *Celmisia*, *Cassinia*) require apparently a reduction of the present number of *book-species*, and the establishment of more comprehensive *types*. Nor am I satisfied that the *genera* themselves, in some instances, do not require revision or reduction in number.

Genus I. OLEARIA (*Eurybia*, Fl. N. Z. pr. p.), includes some of the most ornamental shrub-trees of New Zealand,—the so-called " Daisy-trees " of colonists. The blossom is not unfrequently white and very profuse, contrasting well with the glossy, handsome, green foliage. Some of the showy-flowered species abound to such an extent on the hillsides, or plains of the interior, that, at a distance, travellers have frequently mistaken these flower-carpets for beds of snow!

In cultivation in this country, they have proved hardy and most ornamental. *O. ilicifolia*, *O. dentata*, and another referred by Gorrie to *O. insignis*, Hook. f. (the *Eurybia eminens* of florists), also a South Island species, have stood out on walls at Trinity, near Edinburgh, for the last eight or ten years. The latter species covers a wall 10 feet high, with a southern exposure, in the Dean Cemetery, Edinburgh, where it is also grown separately. In both positions, it has flowered abundantly for a series of years (Rae), and is very handsome in flower. *O. ilicifolia* also grows out at Saughton Hall, near Corstorphine, Edinburgh (Lowe).

In a few species, the stem attains considerable dimensions, becomes woody, and the wood is richly coloured, close-grained, and hard ; so that it is serviceable in cabinet-work. *O. ilicifolia* grows 20 feet high, with a trunk of the diameter of 2 feet (Buchanan), while of *O. dentata*,

polished ornamental slabs were shown in the Industrial Exhibition at Dunedin, in 1865.

A few species appear to be confined, more or less, to the west coast, or the central lake districts (*e. g. O. operina*, Hook. f.; *O. Colensoi*, Hook. f.; *O. moschata*, Hook. f.; *O. nummularifolia*, Hook. f., and *O. Haastii*, Hook. f.). Some of them are great ornaments of the scrub or bush on the shores of the Western Fjords, *e.g.* Chalky Bay (Hector). A few grow frequently also at considerable elevations [*e.g. O. nummularifolia* and *O. Haastii*, up to 4500 feet, on the Canterbury Alps]. Haast mentions species of *Olearia* as occurring among or forming part of the "scrub" that immediately succeeds the Fagus forest and Fagus scrub on the mountains of the Grey River district, on the west coast of Nelson, at an elevation of between 3000 and 4300 feet, where, moreover, they are abundant.

Matthews reported to me a supposed new species, which he designated *Eurybia salmarifolia*, as occurring in the Kaikorai creeks, Green-island. I saw, however, no specimens, and suspect his plant is referable to *O. virgata*, Hook. f.

Of a total of twenty New Zealand species of *Olearia*, at least twelve, or more than one-half, occur in Otago.

1. *O. nitida*, Hook. f. (*Eurybia*, Fl. N. Z.) Banks of streams, ravines of the Chain Hills; Stoneyhill bush; November and December, in flower, W. L. L. A shrub only, wherever I found it. In the bush, Mount Cargill, Dunedin (Matthews). Common as a bush on the sandy soil of the river terraces of the Hokitika, on the west coast of Canterbury, associated with *Veronica* and *Coriaria* bushes. On the Canterbury west coast it is known as "Ake-ake" (Haast), a term generally applied in other parts of New Zealand to *Metrosideros scandens*, or other species of *Metrosideros*, though also to *O. avicenniæfolia* (Hector), and in the Chatham Islands to *O. Traversii*, (Travers). On the mountains of the west coast of Nelson it is abundant, at elevations of 3000 to 4300 feet (Haast).

One of the most ornamental species, very showy in flower; wood close-grained, with yellow markings (Buchanan).

Stoneyhill bush specimens represent a larger, few-flowered form of the plant, while those from the open gullies of the Chain Hills represent a smaller, many-flowered form. Branches in both forms glabrous and grooved. Tomentum most abundant, (as usual, where it occurs),

on the young leaves, and leaf and flower-shoots. It varies somewhat in the fineness of the hairs of which it consists, and in their number and closeness of aggregation and appression. On the under side of the leaf the hairs are so fine, short, and closely appressed, that they produce a very delicate, uniform felt, of such tenuity as to admit of all the minute reticulations of the leaf being distinctly seen through it; the leaf-surface really appearing to the naked eye to be glabrous. Here a silvery or shining surface is produced; on the other hand, on young leaves and on the flower-pedicels, the tomentum becomes chaffy and brown. Leaf generally broadly ovate, tapering to a point, $2\frac{1}{2}$–3 in. long, $1\frac{1}{4}$–$1\frac{1}{2}$ in. broad; dries blackish above, a colour which contrasts strongly with the whiteness of the tomentum of its under surface; leaf-surface generally irregularly wavy, seldom flat; margin never toothed, sometimes entire, generally irregularly sinuate or notched; sometimes thickened; very coriaceous; sometimes unequal at base; veins and reticulations conspicuous below; petiole about $\frac{1}{2}$ in. long. Inflorescence, a panicle rather than a corymb, 3–4 in. across, much branched or the reverse; branches loose, or close, or spreading; panicle-form most distinct when flowers are few; pedicels slender, terete, stouter and longer when panicle few-flowered, $\frac{1}{4}$–$\frac{1}{2}$ in. long, more villose in the smaller forms. Head resembles that of a *Solidago* or *Eupatoria*, variable in size, generally under $\frac{1}{4}$ in. long. Involucral scales vary in size, texture, and villosity of outer surface and margin; scarcely rigid; oblong, lanceolate, obtuse; outer submembranous, as pilose as the flower-pedicels; inner subglabrous submembranous (more so than outer); margins of greater tenuity than centre—with the tips only, or chiefly, or the whole margins, ciliate-lacerate. Pappus generally reddish or orange, at least in herbarium specimens.

I have no authentic specimens of the North Island species *O. furfuracea*, Hook. f.; but from the description in the 'Handbook,' I doubt whether it and *nitida* are properly separated. My plant, assigned by Dr. Hooker to *nitida*, seems to be a passage form, approaching the characters of *furfuracea*.

2. *O. avicenniæfolia*, Hook. f. (*Eurybia*, Fl. N. Z.). Stoneyhill bush; top of the "Big rock," Saddlehill; October, young, W. L. L. The "Ake-ake" of the Otago Maori (Hector), a term also applied to *O. nitida* (*q. v.*). A large, handsome shrub, with somewhat the habit of our *Eupatorium cannabinum*, L. As ornamental as the pre-

ceding, with abundant showy flower. Its wood resembles that of *O. nitida*, *O. dentata*, *O. ilicifolia*, and *O. Forsteri*, in being close-grained, with yellow markings, and thus suitable for cabinet-work (Buchanan).

My plant is named *avicenniæfolia*, in my herbarium by Dr. Hooker. Branches glabrous. Foliage resembles that of *nitida*, except that the leaf is longer and more elliptical, lanceolate, subacute, 3½–4 in. long, varying from ½ in. to 2 in. broad, more finely and distinctly reticulate, fossulate above, more glossy and less black; upper surface naked, under surface silvery-tomentose as in the preceding. Leaf generally flatter, but with tendency to curling; edge entire, but usually with tendency to slight irregular notching. Petiole about ⅓ in. long. Midrib more prominent than in *nitida*.

3. *O. dentata*, Hook. f. In the bush, and on open ground; Flagstaff and Pine Hill ranges, near Dunedin; December in flower, W. L. L. Very common on the shores of Thompson's Sound on the west coast, where it ascends to 1800 feet, and attains considerable size, becoming sometimes a "bush" tree (Hector).

"New Zealand Holly" of the Otago settler, having curled and spinous leaves, like those of our *Ilex Aquifolium*, L., or *Eryngium maritimum*, L.

Buchanan describes two varieties, *α. oblongifolia* and *β. leneariifolia*. The stem of the former he represents as attaining a diameter of 18 in. about Dunedin, and as furnishing a wood "close-grained and well marked for cabinet-work." (N. Z. Exhib. Catalogue, p. 68.)

I have no doubt that *O. dentata* has been in great measure confounded with the succeeding, to which the colonial name, and many of the foregoing remarks, more properly apply.

4. *O. ilicifolia*, Hook. f. This has, according to the Handbook Fl. N. Z., distinctly spinous, Holly-like leaves; and it is this species, perhaps, rather than the preceding, which is entitled to rank as the representative in Otago of our British "Holly." Both *O. dentata* and *O. ilicifolia* are likely, as Buchanan remarks, if properly trained, to make excellent and very ornamental hedges.

Leaf oblong in my specimens, tapering to a point, terminating generally in a tooth, similar to those which fringe its margin; base subtruncate; about 2 in. long and ½ in. broad; margin waved as well as toothed; veins nearly at right angles to midrib; tendency to pilosity of tip, as in *nitida*. Tomentum distinct only on young leaf-shoots; but there is the same tendency, as in *nitida* and *avicenniæfolia*, to

tomentosity of under surface of leaf. Hairs have a tendency towards a reddish hue, as in *nitida*. In one specimen, upper surface of leaf dries blackish-green, while below the normal green colour (not a yellowish hue) remains. In another plant the upper surface retains its beautiful lemon-green, or it assumes a slight brownish tinge. Whether or not my plant is *ilicifolia*, it certainly is not remarkable for its yellow hue in the dried state; nor am I sensible of any odour in herbarium specimens. Branches and panicle glabrous; inflorescence a panicle rather than a corymb, in my specimens. Heads few-flowered; involucral scales subglabrous.

Without a suite of authentic specimens of *dentata* and *ilicifolia*, it may appear presumption to call in question Dr. Hooker's opinion, that they are certainly distinct as species. The descriptions given in the 'Handbook,' and a comparison thereof with my plant, do not, however, convince me of their distinctness.

5. *O. virgata*, Hook. f., and var. γ, Handb. Fl. N. Z., occur as shrubs in the Greenisland district. Buchanan describes them as ornamental, with small, linear, fascicled leaves.

In the N. Z. Exhibition Catalogue (p. 68), Buchanan also mentions the following as Otago species:—

6. *O. nummularifolia*, Hook. f. A very ornamental shrub, with a most characteristic name, and small, round, closely-set leaves.

7. *O. operina*, Hook. f. The "Tuté" or "Tupari" (Hector) of the Maori; the latter term being also applied, according to him, to *O. Lyallii*, Hook. f. A most ornamental shrub-tree, "remarkable" for its leaves being arranged in star-fascicles, centred by large, white flowers. Confined to the western seaboard.

8. *O. Colensoi*, Hook. f. Also an ornamental shrub-tree, occurring often at elevations of 3-4000 feet, apparently in the western districts.

9. *O. moschata*, Hook. f. Also ornamental, and musk-smelled,—a character, however, common to various other species [*e.g. O. dentata* and *O. ilicifolia*]. Leaves small, ovate.

10. *O. Cunninghamii*, Hook. f. An ornamental shrub-tree, with very showy flower; abounding on west coast. The "Ake-wharangi" or "Wharangi-piro" (Lyall) of the Maori.

11. *O. Forsteri*, Hook. f. Also an ornamental shrub-tree, but with few flowers. Wood as in *O. avicenniæfolia*.

12. *O. Hectori*, Hook. f. A very ornamental shrub-tree.

Genus II. SENECIO. Like *Olearia*, includes some of the most ornamental, arboreous, and shrubby *Compositæ* of Otago, beautiful alike in foliage and blossom. Some species abound on the ranges of the south-eastern districts, at elevations of between 1000 and 2000 feet (Buchanan); while forms of certain common lowland species [*e. g. S. bellidioides*] ascend as high as 7000 feet, on the western alps. In Nelson, on the mountains of the west coast, species of *Senecio* commonly attain an elevation of 3000 to 4000 feet (Haast).

1. *S. lautus*, Forst. (var. γ. *macrocephalus*, Hook. f. in my herbarium). Greenisland Peninsula; and sand dunes about mouth of the Kaikorai; November, in flower, W. L. L. Has much the appearance of our *S. vulgaris*, L., and *S. viscosus*, L., which it may be held here so far to represent.

Plant glabrous. Dries to a leathery brown in some specimens; while others retain somewhat their greenness of leaf. So infinitely variable is the leaf in its characters that it is equally impossible and unnecessary to describe all its forms. Its most prominent variations relate to its general form, and to the nature and degree of its divisions. Sometimes the leaf is 4 in. long and 1 in. broad; tapering below into a petiole, which is occasionally 2 in. long; most frequently obovate; very irregularly runcinate-pinnatifid; sometimes 3- or more-pinnate, the pinnæ being again subdivided like the more simple leaves. No leaves are entire; many resemble those of *Erechtites arguta*, than which they are generally larger. Auricles scarcely amplexicaul.

Tarndale specimens in my herbarium more resemble *Erechtites arguta* than do Otago ones. Heads about as long as those of *E. arguta;* the broader corymb more resembles the panicle of *E. quadridentata.*

2. *S. bellidioides*, Hook. f. Among "scrub," base of Stoneyhill; December, in flower, W. L. L. My plant apparently corresponds to var. γ of the 'Handbook' (p. 159). It appears to me unnecessary to place on record such varieties or forms as the three there given. Scape in my plant glabrous 3–4 in. long; 1-flowered. Hairs brown, chaffy, coarse; most distinct and abundant in the young leaf-shoots, and especially in the young leaf-petioles. Leaf becomes blackish-green in herbarium; 1½ in. long and ¾ in. broad; broadly lanceolate or ovate, tapering into a short petiole (½ in. long). Apex subacute or rounded; margin entire, or subcrenulate and subundulate; rugose reticulation of surface most distinct in the older leaves.

Buchanan, in the N. Z. Exhib. Catalogue (p. 68), mentions the following also as Otago species :—

3. *S. rotundifolius*, Hook. f. The "Puheritaiko" of the South Island Maori (Lyall). A very ornamental shrub-tree of west coast. Flowers in corymbs. Leaves thick, leathery, 3-7 in. long.

4. *S. eleagnifolius*, Hook. f. Also an ornamental shrub-tree. Leaves elliptico-oblong; flowers in racemes.

5. *S. sciadophilus*, Raoul. A climbing shrub of rambling habit.

Genus III. Cassinia.

1. *C. fulvida*, Hook. f. (*C. leptophylla*, Fl. N. Z. pr. p.). Uplands about base of Saddlehill; Chain Hill ranges; Lookout Point near Dunedin; Kaikorai valley and slopes of Kaikorai Hill; October, in flower, W. L. L. Usually forming "scrub;" frequently intermixed with the dwarf scrub forms of the *Leptosperma*, and probably confounded therewith by the settlers under their designations "Manuka" or "Tea-tree."

The plant was named by Dr. Hooker in my herbarium *C. leptophylla*, but in his 'Handbook' (p. 145) he evidently refers it to *C. fulvida*. I have no authentic specimens of the former; but the descriptions of the two species in the Handb. Fl. N. Z. lead me to refer both to one type. I suspect they grow intermixed and exhibit passage-forms. I doubt whether mere glutinosity and the fulvous colour of the tomentum of the under side of the leaf are sufficient characters for separation as *species*.

Again, the only good difference between *fulvida* and *Vauvilliersii* seems to me to be the constantly narrower leaf in the former. There is much less difference between these *species* than between *varieties* of the species of several other common Otago plants [*e. g. Rubus australis*]. *C. fulvida* seems to connect *leptophylla* with *Vauvilliersii*. Probably all the N. Z. *Cassiniæ* at present known will at no distant date be united into one or at most two *types*. What appears to be a dwarf, procumbent form of *fulvida* has proved hardy in cultivation about Edinburgh. At Trinity it has stood against northern and western walls for two winters (1865-7). Some exposed shoots only were injured by the frost of January, 1867 (Gorrie). In this cultivated form, there is no tomentum on leaf or branches; nor is there any glutinosity. Both leaf and branches are quite glabrous. But the under side of the leaf, in the young wholly, and in the old in patches, is stained a gam-

boge-yellow. The plant is microphylline; leaf under $\frac{1}{4}$ in. long and $\frac{1}{12}$ in. broad, linear-oblong, obtuse, shining above.

2. *C. Vauvilliersii*, Hook. f. Signal Hill, N.E. valley, Dunedin; December, in flower, W. L. L. Larger-leaved and with handsomer white flower than *fulvida*. Ascends to elevations of 3500 feet, *e. g.* on Mount Egmont (Buchanan).

All the three species of *Cassinia* above named are more or less ornamental, especially in cultivation, being hardy evergreens, with coriaceous leaves (Heath-like in *leptophylla*), the flowers supplying "an abundant nectar for bees" (Buchanan).

Genus IV. CELMISIA.

1. *C. coriacea*, Hook. f. The "Cotton-plant," according to Buchanan; the "Leather-plant," according to Hector, of Otago; the "Cotton-grass" or "plant," or "Leather-plant," of Nelson and other provinces; terms, however, applied apparently also to other species of *Celmisia*. The "Tikumu" of the North Island Maori (Colenso).

The leaves are covered with a down similar in its character and uses to that of the "Kaha-Kaha"* [genus *Astelia*, N. O. *Liliaceæ*]. Specimens of the "dressed fibre" of the leaf and of native cloth manufactured therefrom were shown in the N. Z. Exhibition of 1865.

Of a total of 24 New Zealand species of *Celmisia*, at least 14 occur in Otago; that is, more than one-half of the whole.

Genus V. MICROSERIS.

1. *M. Forsteri*, Hook. f. In moist shady places about Fairfield, Saddlehill; marshes, Abbott's creek, Greenisland; October to December, in flower, W. L. L.

Leaves apt to be infested by the parasitic *Æcidium Otagense*, Lind. (Observ. Otago Lichens and Fungi, Trans. Royal Society of Edin., vol. xxiv. p. 432, plate xxx. figs. 71–4).

Genus VI. CRASPEDIA.

1. *C. fimbriata*, DC. Uplands about base of Saddlehill; December, in flower, W. L. L.

A slender plant. Tomentum very sparing on any part of it; fringe of white tomentum on leaf either very slight or absent. Leaf generally under 3 in. long and $\frac{3}{4}$ in. broad, tapering into a slender petiole about or under 1 in. long; lamina broadly spathulate, glabrous; tendency to irregular subcrenulation of margin; dries to a blackish-green. Head under 2 in. in diameter.

* 'Jurors' Reports,' N. Z. Exhib. 1865, p. 126.

C. Richei, of florists, described by them as an Australian and Tasmanian species, as I have seen it in cultivation about Edinburgh, does not appear to me to differ essentially from the Otago plant. It is, however, greatly larger and stouter. I saw it 2 feet high and in flower in the Dean Cemetery (July). It grows vigorously "in the open" in this country, and is one of those somewhat numerous New Zealand plants that experience already proves to be *hardy** under cultivation in Britain.

Genus VII. VITTADINIA [*Eurybiopsis*, Fl. N. Z.].

1. *V. australis*, A. Rich. Top of the Ferry Bluff, Clutha Ferry; December, in flower, W. L. L.

My Otago plant is under 6 in. high. Young branch-shoots very hispid; sometimes the woody, older branches are also more or less clothed with the same long, flexuose, whitish hairs. Leaves also hispid, with long, coarse, straggling hairs; sometimes nearly ½ in. long and ¼ in. broad; 3-lobed at apex [mid-lobe being the larger]; rounded; obovate-spathulate. Upper and young leaves frequently or generally simple or entire,—notching of the margin occurring subsequently in the older and lower leaves. Pappus ⅓ in. long; reddish as in various species of *Celmisia*.

Tarndale specimens in my herbarium are more procumbent, more slender, with smaller leaves; less hispid in all parts of the plant (mostly glabrous); the hairs (where present) few and chiefly fringing the leaf-margin. Branches more distinctly prolonged into a filiform peduncle. Flower-head about ½ in. in diameter in both series of forms [Otago and Nelson].

Genus VIII. LAGENOPHORA.

1. *L. Forsteri*, DC. Uplands about Fairfield, Saddlehill; 2–3 in. high; October, in flower, W. L. L.

The "Daisy"† of the Otago settler; a beautiful miniature representative of our *Bellis perennis*, L. Probably the "Papataniwhaniwha," or "Daisy-like plant,"‡ (Williams) of the North Island Maori.

* *Vide* Author's 'Contributions to New Zealand Botany' (1868), p. 20.

† According to Dr. Hooker, "the only representative of the Daisy in New Zealand" is *Brachycome Sinclairii*, Hook. f. British nurserymen, on the other hand, assign the name "Native" or "New Zealand Daisy" to *Cotula minor*, Hook. f.; and to a *Vittadinia*, said to be from New Zealand, which is cultivated as *V. trilobata*.

‡ A term which may belong partly or only to *Brachycome Sinclairii*, or *B. odorata*, Hook. f.

Scape glabrous; bractless; about 2 in. high. Hairs most plentiful as usual on young leaves and petioles; long, brown, coarse, sparingly or copiously fringing leaf-margin. Leaf-petiole generally under $\frac{1}{4}$ in. long. Lamina $\frac{1}{3}$–$\frac{1}{2}$ in. long, variable in form and size; suborbicular or ovate, or even subspathulate, apex acute; margin toothed, sometimes nearly entire; not more lobed about base than above; dries to a blackish-green. Head about $\frac{1}{3}$ in. in diameter.

2. *L. pinnatifida*, Hook. f. Occurs in the same habitat as the preceding, with which it is apparently sometimes intermixed and apt to be confounded.

Genus IX. COTULA.

1. *C. coronopifolia*, L. Marshes on the roadsides about the Forbury, Dunedin; 6–8 in. high, with yellow button-like heads; December, in flower, W. L. L.

The representative in Otago of our British marsh forms of *Bidens* and *Pulicaria.* In my Otago plant the stem is usually 6–7 in. high. Leaf very variable in size and form, according to its position on stem. Under 2 in. long and $\frac{1}{3}$ in. broad; suboblong; irregularly and sometimes doubly pinnatifid; upper leaves less cut than lower, becoming subsimple or sometimes entire. Head about $\frac{1}{3}$ in. in diameter.

Specimens from Nelson (Travers) in my herbarium represent altogether a much more delicate or slender, more erect plant—smaller in all its parts—4–7 in. high. Leaves: upper simple, linear-lanceolate; lower generally 3-fid at tips, with long, linear-oblong segments, central largest; never so much cut as in Otago forms; quite as glabrous; no secondary division of leaf-segments. Head $\frac{1}{4}$–$\frac{1}{3}$ in. in diameter. Flower-peduncle sometimes $1\frac{1}{2}$ in. long, filiform, drooping.

2. *C. dioica*, Hook. f. Sand dunes and swamps about mouth of the Kaikorai, W. L. L.

Genus X. ERECHTITES.

1. *E. arguta*, DC. Roadsides, Caversham, Dunedin, 15–18 in. high; Chain Hill ranges, 18–24 in. tall; December, in flower and fruit, W. L. L.

Leaf very variable in form and size, and in the number and character of its divisions. Sometimes 3 in. long and $\frac{3}{4}$–1 in. broad, but more frequently from $\frac{1}{4}$–$\frac{1}{2}$ in. broad. Form broadly lanceolate in larger leaves; linear-oblong in the smaller; and every gradation between these extremes. Margins revolute. Segments sometimes long and sublinear;

sometimes in the form of simple or double, rounded, large teeth. Lower and basal leaves frequently prolonged below into a petiole, which is often 1 in. long; upper leaves only are sessile, with auricled base. Amount of cottony coating varies greatly; sometimes very indistinct to naked eye; always most prominent and abundant on the *young* leaves, and flower and leaf-shoots. Involucral scales sometimes glabrous, or nearly so.

2. *E. quadridentata*, DC. Uplands about Saddlehill; December, in flower, W. L. L. The "Peka-peka" or "Peki-peki" of the South Island Maori (Lyall).

A much more slender plant than the preceding. Cottony down more appressed and finer; best seen on under side of leaf and on lower part of the grooved stem [young leaf-shoots very cottony-silvery]. Head panicled rather than corymbose; panicle very open or lax, 4–5 in. long and 3 in. broad. Heads few; involucral scales glabrous. Bracts generally also glabrous. Leaf subspathulate below, linear above. Lower leaves generally under 3 in. long and $\frac{1}{4}$ in. broad; while upper are less than $\frac{1}{8}$ in. broad. Lower basal ones longest and petioled; while upper one sessile. Margin sometimes with a slight tendency to notching; not more distinctly revolute than in *arguta*. Apex acute, subrigid.

Genus XI. Gnaphalium. "Pūatēa" is a Maori term apparently applied to such species as are used medicinally by the natives. Some species appear to be both luxuriant and hardy in cultivation in this country. Thus at Trinity, in Mr. Gorrie's hands, two or three very woolly-leaved annual forms, received from Otago in 1861, grew so rapidly and vigorously in the open garden, that he reports them "likely to become *weeds* if not kept under."

1. *G. bellidioides*, Hook. f. Uplands about Fairfield, Saddlehill; October, in flower, W. L. L.

My Otago plant has more the characters of *G. prostratum*, Hook. f. I have seen no authentic specimens of the latter; but from comparing the 'Handbook' descriptions of *bellidioides* and *prostratum* with my Otago plants, which have been referred to the former species by Dr. Hooker, I cannot doubt that both species may with advantage be considered belonging to a single type. In my Otago specimens, the whole plant is stouter, more leafy, and more cottony than in Tarndale forms, which agree with the book-characters of *bellidioides*. Branches not ex-

tended into long peduncles. Stem and branches woody, glabrous, shining. Leaves more uniform than in the Tarndale plant, but still variable; more coriaceous, shining and glabrous above; more closely arranged and frequently subimbricate; but they also occur both spreading and recurved in the same plant. Upper leaves approach the linear character, while lower are broadly ovate or lanceolate. Some of the broader leaves are distinctly apiculate, others only subacute. Size of leaf sometimes $\frac{1}{3}$ in. long and about $\frac{1}{4}$ in. broad. Under side silvery without distinct tomentum; even in young and upper leaves the tomentum more resembles a silvery coating of paint [as in some *Celmisiæ*] than cottony matter. Upper surface of young leaf dries a blackish-brown. Nerve or midrib never distinct. Flower-head larger than in the Tarndale plant; sometimes nearly 1 in. across.

Tarndale specimens in my herbarium have the heads on long peduncles, and other characters of *bellidioides*. Stem is much more slender (filiform) than in my Otago plant, and the terminal or pedunculate portion of the branches is much less leafy. Leaves also are smaller and more delicate; upper very small, narrowly linear, passing into lanceolate; lower obovate, apiculate, glabrous above, about $\frac{1}{2}$ in. long and under $\frac{1}{4}$ in. broad; spreading and recurved—not here imbricate. Margins frequently revolute. Under side more or less cottony-silvery [tomentum generally very fine and closely appressed]. Midrib obscure. Flower-heads $\frac{1}{2}$–$\frac{3}{4}$ in. in diameter.

2. *G. collinum*, Lab. Ranges about Finegand, Lower Clutha, 4–6 in. high, W. L. L. So far represents in aspect and habitat our common British *Antennaria dioica*, Gærtn.

My specimens of *collinum* are small and somewhat slender plants under $\frac{1}{2}$ ft. high. Leaves: lower (radical) petioled, under 2 in. long and about $\frac{1}{4}$ in. broad; upper sessile, spathulate below, becoming linear-lanceolate above; acute in both. Capitula small, of few heads.

I have no hesitation in referring all my Otago specimens of *involucratum* and *collinum* to a single type. The only difference between them consists in the larger globular inflorescence of the former, which I cannot, however, regard as a sufficient *specific* distinction. Scape and plant generally are not so cottony in *collinum* as in the spreading, tufted forms of *involucratum*. Stems leafy as in the larger forms of *involucratum*. Leaves have the characters of those of that species, than which they are perhaps less variable; more decidedly glabrous above

than in *involucratum*, but not more acute at tip. Younger leaves as in that species, sometimes very obscurely cottony [with very fine appressed down] above; generally glabrous. Bracts as in *involucratum*, scarcely more foliaceous.

3. *G. involucratum*, Forst. Roadsides near Kaikorai Mill and throughout the Greenisland district; December, in flower, W. L. L.

Sometimes spreading and densely tufted; these smaller forms generally more leafy than taller, erect ones. Stems flexuose; mostly under 1 ft. high. Whole plant cottony; smaller forms more so than the taller. Leaf variable as to form and size. Radical leaves sometimes nearly 3 in. long and ½ in. broad, tapering into a narrow petiole, about 1½ in. long. Form of leaf spathulate. Upper or stem leaves sessile and linear-oblong or linear-lanceolate. Upper surface of leaf sometimes dark olive-brown, shining and wrinkled, subglabrous; sometimes dries a blackish-green. Margin frequently revolute. Inflorescence about ½ in. or upwards in diameter. Head about ⅓ in. long.

4. *G. luteo-album*, L. Among "scrub," on roadsides about Caversham, Dunedin, 15 in. high; sand dunes, Ocean Beach and Forbury Head, dwarf, tufted form, 6 in. tall; December, in flower, W. L. L.

Generally about 1 ft. high. Cottony tomentum, as usual, most abundant and prominent on under side of *young* leaves, stem-shoots, and capitula. Proceeding upwards from base to stem, the leaves which clothe the latter are spathulate-oblong to linear; subpetiolate below, sessile above, as is common in the genera *Gnaphalium*, *Erechtites*, and *Senecio*. Capitula about ½–¾ in. in diameter.

5. *G. trinerve*, Forst. Sand dunes about mouth of the Kaikorai, abundant, W. L. L.

DISCOVERY OF *AIRA ULIGINOSA*, *Weihe*, AT ROUNDSTONE, CO. GALWAY.

By Alexander G. More, Esq., F.L.S.

Another plant is to be added to the botanical rarities of Roundstone. When looking for *Naias flexilis*, I noticed a Grass very like *Aira flexuosa*. From the nature of the locality, and the appearance of the plant, I felt no doubt from the first that I had found *A. uliginosa*, and I am glad to say that my friend Professor C. C. Babington quite

agrees with me in the determination of the species. *A. uliginosa* grows in swampy, spongy flats, surrounding the small lake called, in the Ordnance Map, Cregduff Lough, less than a mile south-west of Roundstone.

July 29, 1869.

[Though new to Ireland, this plant had already been found in Scotland, and was described and figured in Vol. IV. p. 176, by Mr. J. G. Baker.—Ed.]

OFFICIAL REPORT ON THE BOTANICAL DEPARTMENT OF THE BRITISH MUSEUM, 1869.

By John J. Bennett, Esq., F.R.S.

(Ordered by the House of Commons to be printed.)

The principal business of the department during the past year has consisted,—

In the rearrangement in the general herbarium of the families of *Gramineæ*, *Betulaceæ*, *Salicinæ*, *Coniferæ*, and *Cycadeæ*, and of several other smaller families of plants.

In the naming, arranging, and laying into the general herbarium of large collections of plants from the Neilgherry Mountains of India, formed by Metz, Schmidt, and other collectors; of a collection formed by Dr. Schweinfurth in the countries bordering on the course of the Nile; of a collection of the plants of Algeria, formed by M. Romain; of collections formed in the neighbourhood of Smyrna, and in other parts of the East, by M. Balansa; of collections formed by M. Kotschy in Cilicia and Kurdistan; of a collection formed by M. Sagot in French Guiana; of M. Philippi and M. Germain's collections of Chilian plants; of a collection of Californian plants formed by Mr. Bolander; of several collections of Greenland and other Arctic plants; of specimens of Palms from various regions, and of numerous smaller collections from different quarters.

In the rearrangement of a large portion of the collection of fruits and seeds in glass-topped boxes; and of the specimens, recent and fossil, of the family of *Cycadeæ*, incorporating them with the valuable collection presented by Mr. James Yates.

In the examination and arrangement of Mr. Brown's collection of fossil woods, and of the extensive collection of sliced microscopic sections of recent woods purchased from the executors of the late Mr. Bryson, of Edinburgh.

And in the partial arrangement and examination of M. Rupert Huter's and Dr. Alexander Prior's collections of Styrian and Dalmatian plants, and of other collections recently received.

The following are the principal additions made to the collections of the department during the year 1868 by purchase or donation:—

295	species of	British Lichens; presented by Dr. Holl.
50	,,	forming fasc. 1 of Larbalestier's 'Lichens of Jersey and Sark.'
2057	,,	European Lichens, from the collection of M. Hepp.
349	,,	exotic Lichens, from the collection of M. Hepp.
778	,,	Mosses, from the collection of M. Hepp.
1070	,,	*Algæ*, from the collection of M. Hepp.
570	,,	Florideæ, from the collection of M. Hepp.
25	,,	European Lichens, forming No. 29 of Rabenhorst's 'Lichenes Europæi.'
70	,,	*Algæ*, forming Nos. 198–204 of Rabenhorst's 'Algen Sachsens,' etc.
400	,,	European plants, forming cent. 7–10 of Schultz's 'Herbarium Normale.'
50	,,	plants of Belgium, forming fasc. 6 of Van Heurck's 'Plantes Rares de Belgique.'
425	,,	plants of Dalmatia; collected by Robert Huter.
333	,,	,, Dalmatia; presented by Dr. Alexander Prior.
347	,,	plants of Styria; presented by Dr. Alexander Prior.
110	,,	,, Styria; presented by the Chevalier Pittoni.
22	,,	,, Sicily; presented by the Chevalier Pittoni.
200	,,	Sicilian plants, forming fasc. 5 and 6 of Todaro's 'Flora Sicula.'
100	,,	Cryptogamic plants, forming Nos. 27 and 28 of 'Erbario Crittogamico Italiano.'
117	,,	plants of Ceylon; collected by Mr. Thwaites.
80	,,	,, Japan, from the neighbourhood of Yokohama.

333 species of plants of Australia; presented by Charles Moore, Esq.
165 ,, plants from Cape York, North Australia.
72 ,, plants of Tasmania; presented by Joseph Milligan, Esq.
155 ,, Ferns from the Blue Mountains of Jamaica.
541 ,, plants of Martinique; collected by M. Haber.
500 ,, ,, California; collected by Mr. Bolander.
919 ,, ,, Columbia; collected by M. Linden.
1250 ,, ,, Bolivia; collected by M. Mandon.
564 ,, ,, Chili; collected by M. Germain.
954 ,, ,, French Guiana; collected by M. Sagot.

18 specimens of Woods from the neighbourhood of Mentone; presented by H. M. Moggridge, Esq.

38 specimens of Coal Plants from Rio Grande; presented by N. Plant, Esq.

61 specimens of Fossil Plants, from various localities; presented by Sir Charles Lyell.

A series of Coal Plants, from the Island of Cape Breton; presented by Mr. Chevallier.

About 2000 gatherings of *Diatomaceæ*, together with a multitude of notes and sketches relating to them, forming the entire collection of Professor Kützing.

One hundred microscopic slides, forming cent. 1 of Eulenstein's 'Diatomaceæ Typicæ.'

OBITUARY OF FREDERICK SCHEER.

On the 30th of December last, died at Northfleet Mr. Frederick Scheer, seventy-six years of age, a City merchant, whose name is honourably associated with botany and horticulture, and who might have enjoyed a world-wide reputation if his modest and retiring habits would have permitted him to do so, or allowed others to give him due and public credit for what he had done or caused to be done. Mr. Scheer was the exact antitype of those who judge of the value of every publication by the number of times their names are mentioned, and compliments paid to them. Never mind how great the share

which he had had in advancing a project or publication, it gave him pain to see his name made public in connection with it.

Mr. Scheer was born in the island of Rügen, where his father was a clergyman; and the first part of his life was spent in Russia in mercantile pursuits. But when still a young man, he took up his residence in England as a City merchant, and for many years lived on Kew Green, where his neat cottage and well-kept garden and greenhouse (the latter full of new plants imported by him) was well known to botanists. The last years of his life he lived at Northfleet, Kent, where he indulged in his favourite pursuits of botany and gardening to the full extent his business occupations would allow.

Mr. Scheer held advanced liberal views on religion, politics, and political economy, and spoke and wrote several languages with force and ease. Nevertheless, he was extremely guarded in what he put on paper (in that respect taking Robert Brown for his pattern); moreover, most of his writings were anonymous. Intimate as I was with him, I often urged him to make a list of at least his pamphlets, or allow me to do so; but to this I could never get him to agree. It was quite satisfactory to him that his ideas should have been promulgated, he caring little for the honour of having conceived them, as perhaps the next minute he would have already originated new ones, which one was welcome to use. He had a great share in the establishment of the Anti-Corn Law League, the first meeting of which was held in his office; and though his name did not appear much in connection with the subsequent proceedings, he was forging many of the most effective bolts which others discharged at the bulwark of an unjust and cruel law. Cobden was at that time one of his most active correspondents, and often consulted him. A series of papers which about this period appeared in the 'Morning Chronicle,' and subsequently as a separate publication, under the title of 'Diogenes' Letters to Sir Robert Peel,' and which contain some of the best arguments that Anti-Corn-Law Leaguers could employ, were from Mr. Scheer's pen. When, in 1839, the Government thought of doing away with Kew Gardens, he did all he could, through newspapers and in getting up petitions to Parliament, to avert the calamity, and also came forward with a small, but well-written book, 'Kew and its Gardens' (London, 1840, 8vo).*

* I believe I am correct in stating, in parenthesis, that the first note of alarm that Kew Gardens were about to be broken up was given by Mr. John

About this time, Mr. Scheer had one of the largest collections of Cacti in Europe, and was in frequent communication with Pfeiffer, Fred. Otto, and Prince Salm-Dyck, the leading authorities on that subject. His collection was extremely rich in Mexican species, chiefly obtained from Mr. J. Potts. Only a small portion of these were ever described, either by Prince Salm-Dyck or (very reluctantly) by Mr. Scheer himself in Seemann's 'Botany of H.M.S. Herald;' the greater number, however, were subsequently lost during Mr. Scheer's removal from Kew. Several new plants, received from his numerous correspondents abroad, were described and figured by Sir William Hooker, Dr. Lindley, and myself. Amongst his Mexican *Gesneraceæ* I found a new genus (*Scheeria*), which I dedicated to him in the 'Botanical Magazine,' and of which at present two species, both cultivated as ornamental hothouse plants, are known. After losing the bulk of his *Cacteæ*, Mr. Scheer took up Ferns, which he studied attentively; and it was he who suggested to me the plan of the 'British Ferns at One View' (Van Voorst). His great power of combination, coupled with his varied and profound knowledge, gave him an almost prophetic insight into the future, and this was much appreciated by great City firms, who frequently asked his advice on momentous questions of the day. In look he much resembled Beethoven, whose compositions he could play exquisitely. He was a man of remarkable energy, who never had any serious illness during the whole of his life. On the day he died he had been all day in the City, came home, and instead of going after dinner, as usual, to his greenhouse to look at his plants, he went to bed. An hour afterwards he expired, evidently without pain or suffering. His only son died a few years ago; his wife survives him. He was a high-principled, unselfish man, a warm friend, ardently devoted to science, and an uncompromising opponent of all sham, whether it appeared in a religious, political, or scientific garb.

B. SEEMANN.

Smith (late Curator of Kew) and Mr. Robert Heward, F.L.S., who concocted a letter which appeared in the 'Times,' and led to questions being asked in Parliament.

NEW PUBLICATION.

Dottings on the Roadside in Nicaragua, Panamá, and Mosquito. By CAPTAIN BEDFORD PIM, R.N., and BERTHOLD SEEMANN, Ph.D., etc. With Plates and Maps. 8vo. 468 pp. London: Chapman and Hall.

Although comments of any kind on this book—the first half of which was written by Dr. Seemann, the latter half by Captain Pim—cannot be looked for at this place, yet it may not be superfluous to note some of the contents as far as they may concern botany.

The book opens with Dr. Seemann's visit to the Isthmus of Panamá in March, 1866, he having landed at Colon, on the Atlantic side.

"It took four hours and a half to get across the isthmus, which to some of my fellow-passengers seemed long; but not so to me, who had formerly spent four days in going over the same distance. At the various stations where the train stops there are very fine American houses, surrounded by nice flower-gardens and neat white fences, forming a singular contrast with the wretched huts of the native negroes, which are neither better nor worse than I have known them twenty years ago. Yet food is as abundant as ever, and wages are much higher. To me it was a great treat to revel once more amongst the vegetation of a country about which I wrote the first Flora. The palm-groves seemed to nod their feathery leaves in friendly recognition; and many of the trees and shrubs which I introduced to Science seemed to be so many old friends, glad to see me again."

The neighbourhood of Panamá is very fine. In the savanas—

"you have the most lovely park-like scenery in the world,—beautiful short grass, capital for galloping upon, clumps of fine trees and shrubs, a gently-undulating ground, little rivulets and now and then glimpses of the city, the bay, and the islands. A lithogram published by Appleton, of New York, of which nearly all the copies were destroyed by fire, gives an excellent idea of these savanas and their vegetation; and it is the only one I have seen that really does justice to the neighbourhood of Panamá."

In this picture there is a very good illustration of the growth of the singular Hederaceous tree *Didymocarpus Morototoni*, Dcne. et Pl.

Embarking at Panamá on one of the steamers going up the west coast of America, Dr. Seemann landed at Corinto (Realejo), the principal port of Nicaragua, where he "ate a dish of Cabbage-palm, as a botanical curiosity," and thence travelling all night, partly by boat, and partly on muleback, he—

"reached Leon at seven o'clock in the morning, rather tired, and found the street thickly strewn with Roses, Frangipanis (*Plumierias*), Oleanders, and

other scented flowers, the remnants of recent religious processions. . . . The houses of Leon are nearly all but one story high, and built of sun-dried bricks, of *adobes*, and somewhat in the Moorish style, there being a large square yard in the centre of the houses, surrounded by a broad verandah, on to which all the rooms open out. . . . The yards, or *pateos*, are, in some instances, neatly kept as gardens, where one finds a few Plantain, Orange, Pomegranate, Soursop, and Mango-trees, as well as Roses, Cockscombs, Gomphrenes, Frangipanis, Jessamines, and *Polianthes tuberosa;* highly-scented flowers seeming to be those most cultivated. During the dry season these plants require constant irrigation, the water being obtained from deep wells, of which there is generally one in every yard."

In the woods of the neighbourhood—

"we frequently perceived a most offensive, carrion-like smell, which at first was thought to come from some dead animal matter, but was speedily traced to the flowers of a middle-sized tree, in habit not unlike the Caoutchouc (*Castilloa elastica*, Cerv.). This tree our men called 'Palanca,' its wood being used, amongst other things, for levers or *palancas*. The leaves were oblong and velvety, and from the growing branches developed flowers not unlike in shape and size those of Tulips. The most remarkable thing was that these flowers on first opening were quite green, and free from smell, but they gradually changed into a dark purple, almost black, and then emitted a most powerful smell, quite as, or rather more disagreeable, than that of some *Stapelias*, *Aristolochias*, and *Aroideæ*, and, in a less degree, the fruit of St. John's Bread. It is strange that this carrion-like smell in plants should in so many cases accompany a dark brown or dark blue colour, and it would be worth while to endeavour to ascertain the chemical principle here at work. At the base of each of the six petals, the Palanca has a gland, and I fancied that the smell principally proceeded from its secretions. To my delight I found that the plant constituted a new genus of *Anonaceæ*, distinguished by having the largest known petals of the Natural Order to which it belongs. Afterwards I met with it in abundance between Leon and Granada, and collected good specimens of it for our herbaria. At the suggestion of Mr. J. J. Bennett, F.R.S., of the British Museum, I gave it the name of *Sapranthus Nicaraguensis*. I am sorry to add, however, that my travelling companions who afterwards saw me busy myself with the plant would not adopt this correctly-formed and expressive Greek name, but insisted upon dubbing it '*Stinkadora*.'"

After remarking on the so-called mimicry of Nature, Dr. Seemann describes his departure from Leon for the little-known districts of New Segovia and Matagalpa. This happened on the 4th of April, the fag-end of the dry season.

"Towards five o'clock we reached a place called Valle de Zapata, a mere collection of huts, where a little Indian-corn and cotton was grown, the latter being the mossy-seeded variety. The people were much disappointed that the cotton prices had gone down so much, and thought it a hard case that the United States should have discontinued their fratricidal war just at a time when Nicaragua was getting ready to send a few hundred bales of cotton to the Liverpool market. Cotton cultivation in this country has not been successful, in most seasons a worm entering the pods just when they begin to ripen, and thus destroying the crops. If it were not for this, the Nicaraguans delude

themselves by thinking that the produce they might be able to send to Europe would materially affect the prices.

"We started early next morning, and soon after left the cart-road, which ever since our departure from Leon we had been able to follow, and which passed over tolerably level ground, though round the large volcanoes and over fields of lava. The road we now took, Cleto informed us, was a short cut, but, like most short cuts if one is not quite familiar with them, it turned out to be rather a long one. The whole day we did not see a house or meet a single human being, and, except two stagnant pools, the only water we found was a little brook. On advancing, the country became more hilly, and we had to cross valleys full of large boulders, resting on black mould, in the rainy season one mass of mud. It was very warm indeed, and, as most of the trees were quite leafless, as ours are in the depth of winter, we suffered very much from the sun. We soon finished a few bottles of water which we carried along with us, and to quench our thirst ate some Hog-plums and 'uvas' (*Ardisia coriacea*). One of the valleys was full of trees bearing fruits like Oranges; and Captain Holman, delighted at the sight, galloped ahead to gather some. To his disappointment, though not to mine, these 'Oranges' turned out to be the fruit of a Calabash-tree (*Crescentia alata*), the seeds of which the Nicaraguans make into a cooling drink, and sell in some of the shops of the towns, whilst the shell is turned into drinking-cups. After continued travelling in this inhospitable region, we were glad to perceive, towards sunset, a farm, which stood on the top of a hill, and rejoiced in the name of Hacienda de Pilon. This farm struck me as the most tidily kept in the whole of Nicaragua, the principal dwelling-house being extremely clean and comfortable. An evergreen Fig-tree, with a crown of gigantic dimensions, was diffusing a delicious coolness and shade around the place."

After leaving Achuapa, a tolerably large village,—

"The road passed Las Tablas, where for the first time we found ourselves in a most delightfully cool temperature, and in a forest of Fir-trees (*Pinus tenuifolia*, Benth., known by the name of 'Ocote,' a corruption of the Aztec (Mexican) 'Ocotl.') I may, however, add that this is not the most southern limit of the Pines on the Pacific side of America, but that it is, as far as at present ascertained, in latitude 12° 40′ north, on the Volcan Viejo, near Chinandega, at an elevation of three thousand feet above the sea-level, whilst the most northern limit, as I have shown in my Flora of Eskimoland, is on the banks of the river Noatak, in latitude 66° 44′ 0″ north, where Captain Bedford Pim found a regular forest composed of a species (*Abies arctica*, A. Murr.) closely allied to the White Pine. We did not long remain in this delightfully cool atmosphere, but were compelled again to descend into the hot valleys, passing the village of San Juan de la Maya."

The journey thence led to the farm of Bonbon.

"We left Bonbon early the next morning, and travelled about three leagues more in the hot valleys, the vegetation of which was very much like that of the Pacific coast of the Isthmus of Panamá, many of the species being identically the same in both countries. Again ascending some mountain-ridges, we were once more greeted by the Pine-trees and a delightfully cool breeze. Here I found a species of *Oreopanax* with large palmate leaves, new to me; a purple *Salvia*, a pink Melastomacea, and *Pteris aquilina*; a species of *Rhipsalis* grew on the Pine-trees. Saw no snakes, and only one monkey, some macaws, and that beautiful bird with two long feathers in tail, the *Trogon re-*

splendens (which I have also met with as far south as the Volcan de Chiriqui in Veraguas). Until now there had been no sign of any rain, but on this day, the 8th of April, we had a few slight showers. An enterprising Nicaraguan, Don P. Castellon, had established here a coffee plantation, said to contain 40,000 trees."

Jamaili was the next stopping-place, after leaving which, the country—

"was quite parched up, and almost the only green things were some gigantic *Pilocerei*, or Old-man Cactuses, and a few Melon-cactuses and *Opuntias*. We passed the villages of Alanguina and Totogalpa, and crossing the river Coco, the banks of which were clad with Willows, the lovely green of which was quite a relief to the eye after seeing so much dried-up vegetation, we entered, on the 9th of April, 1866, the town of Ocotal, . . . the capital of New Segovia, which derives its name from the Pine, or ocote, formerly plentiful in the neighbourhood. Ocote, or rather Ocotl, is a name of Aztec derivation, brought here, with many others, by Mexican immigrants, during the time of Montezuma; for the Mexican Empire tried to extend its way even further south than Nicaragua. I fancy that a delicious and very wholesome fruit, as large as a good-sized Apple, and much cultivated here, was introduced by the same agency. It is called by the people Matasana, and by botanists *Casimiroa edulis*; and it would doubtless thrive in Australia and southern England, as I found it also in the higher mountains of northern Mexico. Seeds of it were sent to Mr. Bull's Nursery, at Chelsea, where young plants are now to be procured."

Various excursions were made into the surrounding district, where the mountains were generally found to be covered with Oak and Pine, to which were added, at Depilto, Liquidambar-trees, stemless Fan-palms, and some Brambles. On the 19th of April Dr. Seemann departed for Matagalpa, taking an easterly direction, and passing Palacaguina, where he observed near the church a Juniper-like-looking tree, not previously met with by him in any other part of the country. Thence the road led to Yale.

"The scenery about here was truly grand. At the back of the rancho there were thick Pine forests, in front green savanas, sloping down to a rivulet, and, further on, the Montaña de Yale, which we entered the next morning, and where the vegetation was more luxuriant and fresher than we had seen it in any other part of the country. There were beautiful Tree-ferns, and elegant Cane-palms, Liquidambars of truly gigantic dimensions, one hundred and fifty feet high and thirty feet in circumference, being the leading trees, and all being just in leaf, a fine May green, presented an appearance almost equal in beauty to that of a Beech forest at home in early summer. How well this locality would be suited for growing coffee! About six leagues from the 'Boca' is the village of San Rafael, which is situated in a plain, and is composed of forty houses. The people declared there were about 2000 souls in the place and its immediate neighbourhood, which, as there are many farms, may be true. Taking a hasty breakfast, and purchasing some oranges, twenty for one real, we pushed on for Jinotega, a town of two hundred houses and a church,—hedges of tall Yucca-trees imparting to it a rather characteristic look. . . . The

white Convolvulus, which flowers all night, and at the first rays of the rising sun begins to wither, was still in full bloom when we left Jinotega, and after riding in a south-easterly direction about seven leagues over a rough, stony road, we arrived at Matagalpa, the capital of the department of the same name. One of the first buildings on entering the town, for I suppose I must call it a town, though we in Europe would call it a mere village, was a flour-mill, the only one I had seen in the country, Wheat being grown in some of the hills in the neighbourhood, but the flour prepared from it proving very dark and coarse."

The subsequent pages describe Dr. Seemann's return to Leon, and his departure from there to Chontales.

"Passing and stopping for a few hours at Pueblo Nuevo, with its curious Cactus fences, I put up for the night at Nagarote, where I measured a famous Genisaro tree (*Pithecolobium Saman*, Benth.), belonging to the *Mimosa* tribe, of which the villagers are justly proud, and for which 200 dollars have been offered—a high price in a country where timber abounds; and yet they had the public spirit—the rarest of virtues in a Spanish American—to refuse the offer (others say the Government made them refuse). The tree, of which a woodcut is given in Squier's 'Central America,' is but 90 feet high; but some of the lower branches, which are quite horizontal, are 92 feet long and 5 feet in diameter. The stem, 4 feet above the base, is 21 feet in circumference, and the crown of the tree describes a circle of 348 feet. A whole regiment of soldiers may seek repose in its shade.

"If this vegetable monster had been a denizen of any part of the eastern hemisphere, it would have become a fit object of tree-worship, that singular religion which flourished long before temples and churches were thought of, and which enjoyed a more extensive geographical range than any creed has done since. At one time it was diffused over the whole of Europe, Asia, Africa, and Polynesia. Throughout Europe and some islands of Polynesia it has been supplanted by Christianity, in parts of Asia and Africa by Mohammedanism; but nowhere have its rites been entirely suppressed. Deprived of their religious character and import, many of them have survived to this day, everywhere associated with mirth, good feeling, and festivity. No trace of tree-worship has been noticed amongst the natives of Australia, nor amongst those of the New World, though it had penetrated to the easternmost islands of Polynesia. The fact is most singular, as no continent boasts of such magnificent and venerable trees as America. In the virgin forests of Brazil there are trunks of such gigantic size that fifteen Indians with outstretched arms could hardly span them; trunks which, by counting the concentric rings of their wood, must have been in existence when Homer wrote his immortal poem. In Upper California and along the whole north-western coast of America the vegetations attains enormous dimensions and age. Three hundred feet is no uncommon height for a tree, and some of the Wellingtonias overtop St. Peter's, and almost rival the height of the pinnacle of Cheops, whilst their age is such that they must have been in full growth long before the Saxon invasion of England. Yet these peculiarities do not seem to have made any impression on the mind of the American Indian, evidently proving that size, venerable look, and age of trees are not sufficient to account for their worship by the largest section of the human race. Indeed, tree-worship can scarcely have sprung from simple admiration. We have plenty of people among us with a strong leaning that way, and can pretty well judge of its range and scope. The Rev. Charles Young tells us that from childhood, nothing in nature had a greater attraction for him than trees, and a giant tree, such as

that of which the bark existed at the Crystal Palace, had been the height of his ambition among the sights of nature. To gratify this feeling he made purposely a voyage to the Amazon, of which he has given an interesting account in Galton's 'Vacation Tourists,' and one might suppose that when at last he found himself among the vegetable giants of Brazil feelings superior to those of gratified curiosity would come to the surface. But there was nothing of the kind; even a botanical interest does not appear to have been roused in him. Mr. Young's predilection is rather prevalent in the United States, where travellers are almost bored to death by being taken to see big trees. Dr. Russell, who went thither for a very different purpose, and during a period of great civil commotion, repeatedly mentions his being forced to visit such objects; and he tries to account for the admiration Americans have for their vegetable monsters by the fact that in the United States few things are old and venerable, and any exception to that rule is carefully noticed. I remember, in passing through Cambridge, Massachusetts, seeing a black board, recording that the mayor and alderman of that town had been such Vandals as to cut down an old and large tree which stood in the middle of the road, and underneath was written with chalk, 'Let this be remembered at the next election!'"

"A ride of three days from Managua, by way of Tipitapa and Juigalpa, brought me to Chontales, the finest and most fertile district of Nicaragua. Approaching it from the west, as I did, you find yourself amongst rich undulating grass lands, which even at the end of the dry season retain their verdure and afford pasture to thousands of heads of cattle. On nearing Libertad, the ground becomes more elevated, the climate considerably cooler, and you get occasional glimpses of the Lake of Granada, with its islands and majestic volcanoes. . . . Close to Libertad commences a dense virgin forest, which extends to the Atlantic seaboard, and a singular feature of which is, that the stems of the trees are of a very light grey, as well indicated by Mr. George Chambers in some of his clever sketches; but the correctness of which I was inclined to doubt until I had actually seen it in the landscape itself."

After giving the history of the gold-mines of Chontales, and describing its population, the author proceeds:—

"In these mountains a species of caoutchouc (known here by its Aztec name of Ule), vanilla, sarsaparilla, quassia, fustic, and other valuable woods abound, and there are many vegetable productions perfectly new to science. Amongst the most noteworthy are a Pitcher-plant (*Marcgraavia*), every umbel of which terminates in five flower-bearing pitchers filled with water, a large white Sobralia, and a tree (*Herrania purpurea*, Decaisne), with fingered leaves and small seeds, which are occasionally offered for sale by the Indians, and from which chocolate of a flavour superior to that of the common Cacao is manufactured. Some day this chocolate-tree will doubtless be extensively grown by Europeans; and, as it occurs in these woods together with the common naturalized Cacao, it may have been cultivated when this district was more thickly inhabited by Indians than it is at present.

"The Chontales gold region appears to be a favourite haunt of plants with variegated leaves. There are some fine species of Costus (including, besides the well-known *C. zebrinus* and *Malortianus*, several new ones; two beautiful species of Cissus, one with bright scarlet flowers, introduced by me into English gardens); and several *Marantaceæ* and *Aroideæ*. But the finest of these is the one I have named *Cyrtodeira Chontalensis*, a Gesneraceous plant. The leaves are purple on the under side, and on the upper light green (like those of *Begonia smaragdina*), with very dark green blotches. The flowers, which appear in November and December, are lilac, and as large as a crown piece, with a

yellow centre, and a whitish tube. The roots are fibrous (not catkin-like rhizomes, as in the Achimenes tribe); and in habit the plant resembles the only other known species of the genus (*C. cupreata*, Hanstein), which, however, has smaller and scarlet flowers, and a hairy ovary. It was found at the Pavon end of the Javali Mine, where it grew in only a very small spot—shady groves on the banks of a rivulet. Although we became afterwards well acquainted with the vegetation of the district, we never met the plant anywhere but there; and after we had taken up sixty specimens, and planted them in a miniature Wardian case, fire was set to the very spot where the *Cyrtodeira* grew, for the purpose of clearing it. The sixty specimens readily took root, and on our departure a boy was engaged to carry them on his saddle before him to Leon, a distance of about eighty leagues. All went on well, till one evening darkness overtook us on the immense grassy plains of Tipitapa, and the boy's mule fell into one of those wide cracks which during the dry season in the tropics always form where the ground is clayey. Down came the Wardian case with a heavy crash, and one-half of our plants were lost. The other half looked well enough till within two miles of the port of embarkation, when the waggon in which, for greater safety's sake, they had been placed, went into a deep hole, and turned right over. This time all but six specimens were destroyed, and these were so much injured that when we arrived at London, and handed them to Mr. W. Bull, of Chelsea, the enterprising plant merchant, only one was found to be in a sound condition; but that one has become the progenitor of a numerous race, which now ornaments our hothouses."

In subsequent chapters Dr. Seemann details his second visit to Nicaragua. About La Merced, on the Lake of Nicaragua, and—

"I may add, in many other parts of the country, I noticed a goodly number of the trees which yield the dyewood known by the name of Fustic in commerce (*Maclura tinctoria*). It belongs to the Mulberry family, and is termed 'Moran' by the natives. The fruit is sweet and edible. The wood might be profitably collected for export if there were any good ways of communication, as it fetches sometimes as much as £5 per ton in Liverpool. At present nobody notices it."

At p. 196 an ascent of Peña Blanca is described, which is the highest known peak of Chontales, and may be about 2500 feet above the sea-level.

"The vegetation of Peña Blanca is distinct from that of any other mountain-top I have seen in Chontales. I found a fine purple Lobelia, a scarlet caulescent Orchid (*Ornithorhynchos*), and a crimson Macleania. Much to my regret, many of the woody plants had been destroyed by fire. On my last ascent the gentleman who had kindled the flame was with me, and was somewhat astonished when, instead of receiving unqualified praise for having cleared the view, I told him it was fortunate, standing as we did on the brink of a yawning precipice, that the enraged botanist within me was somewhat mollified by my appreciation of the fine landscape which he had, as it were, unrolled.

"Peña Blanca commands a very fine view. You cannot see any rivers, though they discharge themselves into the Atlantic, the Javali entering the Mico, and the Mico the Blewfields; but you can see the Javali lode of auriferous quartz rocks for several miles, and distinctly trace the various branches

(which in many instances have proved extremely rich) running into it. Further on, the eye, passing over dense virgin forests, encounters green savanas."

Dr. Seemann had a picket cut through the virgin forests, in order to gain a more ready access to the Atlantic seaboard. An official report on the first forty miles, by the surveyor, addressed to him, is here inserted, and contains the first botanical information we have about this unknown district. The picket was cut from the Javali Gold Mine, and about four miles off the exploring party found several Cedro trees (*Cedrela odorata*) cut down, probably by wild Indians. Nine miles off—

"commences a regular Coyolal (palm grove), which extends over a plateau of at least four miles, the Palm-trees being so close and regular that the whole looks as if planted. The trees were heavily laden with four to eight bunches of coyol nuts; and there were also many of the so-called Corozo Palms (*Attalea Cohune*), which, by their gigantic size and singular flowers, presented a beautiful appearance. Eleven miles off the quebreda has sufficient water to drive a mill for the purpose of making coyol oil, which, in my opinion, might prove a profitable business where, as is here the case, it could be carried on on a large scale, there being millions of these oil-yielding Palms."

At sixteen miles off—

"There is a quantity of wild Cacao (*Theobroma Cacao*), and also of the small Cacao (*Herrania purpurea*), which you took to England with you; of course, conclusive proof of the fertility of the soil. We also found a little Sugar-cane, which may have been planted by the Indians."

Dr. Seemann's pages close with his second visit to Nicaragua, his third, from which he has only recently returned, not being alluded to. It was during this third visit that he was so fortunate as to discover, near the Javali Mine, the gigantic Aroid, on which the 'Gardeners' Chronicle' had the following communication, extracted from a letter of Dr. Seemann to Mr. William Bull, and also the subsequent article:—

"I have just procured for you a truly wonderful Aroid, which has, so far as my knowledge goes, the largest flowers (say, rather, spathes) known in the Natural Order to which it belongs. Just imagine a peduncle rising from a rhizome larger than a man's head, and being itself four feet high and four inches in diameter, bearing an upright spathe, which measures two feet in length, and one foot eight inches across, and enclosing a spadix four inches long and nine lines across. Like my *Sapranthus Nicaraguensis*, it emits a powerful carrion-like smell, and has also on the outside the same dark purplish-blue colour as the beautiful *Anonacea* just mentioned. The spathe is reddish-brown, with the exception of the part surrounding the spadix, which is yellowish-white. The plant has only one leaf, which also rises from the rhizome, and after fully developing, dies off. The whole length of the leaf is thirteen feet eight inches; the petiole alone measures ten feet (all the measurements are English).

"The paragraph extracted from one of my letters, which you published on the 27th February last, about the gigantic Aroid discovered by me in the mountains of Nicaragua, has had the good fortune to make the rounds, not only of the English and Continental papers, but also of the American, and been commented upon in many ways, even by your facetious contemporary 'Punch.' I dare say some thought, when reading of the dimensions of the plant, that I, when penning that paragraph, allowed my imagination to run riot, and was dishing up a mere traveller's tale. But I took the precaution to preserve the flowers in spirit, and send to Mr. William Bull two fine rhizomes of the plant. Both of the latter are now growing, and one of them, received in England only on the 17th of April, is now in a fair way of proving that I rather understated than overstated the case. It is in a pot of only eleven inches in diameter, and on the 28th of June, the petiole of the leaf (the plant has only one leaf at a time) was seven feet high and nine inches in circumference. The blade is not yet developed, and I believe that before this communication sees the light, the petiole will have attained more than ten feet, the height it had in Nicaragua. It looks like a huge snake (beautifully mottled) standing bolt upright at the command of some Eastern charmer. I may add that the leaf in the present state already exceeds the largest recorded dimensions of all other *Aroideæ* with a like habit, and, when fully developed, it will turn out to be what I said it would, the largest Aroid, both in leaf and flower, of which we have cognizance. The flowers being hermaphrodite, not diclinous, the giant in question cannot be referred to *Amorphophallus*, *Conophallus*, or allied genera of the Eastern hemisphere, but will, on closer investigation, prove to be either a genuine *Dracontium*, or the representative of a closely allied new genus, which 'Punch' has asked me to name after Gog and Magog. Yielding to the request, it would not be the first barbaric name we should have in botany, and probably not the last either; and who knows what, after due consultation with the City Corporation, I may do?"

Capt. B. Pim, R.N., in his part of the 'Dottings,' confines himself principally to Jamaica and Mosquito, and except a note on India-Rubber Collecting, which had previously appeared in this Journal, there are but few botanical facts. It may be useful to add that the creeper which the Rubber collectors use for thickening the milky juice of the trees, and which Dr. Seemann from native description conjectured to be an *Apocynea*, has now been ascertained by him to be a Convolvulacea, *Calonyction speciosum*.

BOTANICAL NEWS.

Under the title 'Echoes in Plant and Flower Life,' Mr. Leo H. Grindon has published (London, Pitman) a small book on the superficial resemblances in habit and structure of plants whose inner organization is widely different, and to which the term "Mimicry" (see Vol. VI. pp. 182, 213), had previously, but erroneously, been applied.

Died, after a short illness, on the 15th of July, at Teplitz, Heinrich Ludwig

Wendland, who for fifty-three years was the head of the Royal Berg-garden of Herrenhausen, near Hanover, and who attained the advanced age of seventy-eight. He was the son of Johann Chr. Wendland (the coadjutor of Schrader), and the father of Hermann Wendland, author of several valuable papers on Palms. Though displaying less literary activity than his father, we have from his pen a work on the phyllodinous Acacias ('Commentatio de Acaciis Aphyllis,' Hannoveræ, 1820), in which he describes and figures a number of new species of that group, with which he had become acquainted chiefly during his stay in England; and, a few years later, in conjunction with Professor Bartling, of Göttingen, his 'Beiträge zur Botanik' (Contributions to Botany), of which two volumes appeared (1824–25), the first containing the well-known monograph on *Diosmeæ*, the second, miscellaneous matter. Subsequently he published merely a few short horticultural and botanical articles in German periodicals, but to the last he took a vivid interest in all that relates to botany and gardening. The establishment under his charge was admirably conducted and pre-eminently rich in *permanently-grown* species, though some of the Continental Botanic Gardens beat it by counting those annuals and biennials, grown only at periods varying from two to four years. Wendland was fond of old garden-plants, and resisted, as far as lay in his power, the application of the doctrine that selection rather than collection should be aimed at in these places. His garden though never recognized as a botanic garden in the limited sense it is understood in Germany (it not being attached to any University, nor having any professors connected with it), was always regarded as one of the leading establishments of the country, where a large collection of well-grown and correctly-named plants was to be found. It is generally acknowledged that it was entirely due to Wendland's influence that Palms and Cycads (of which he cultivated the largest collection) are now so extensively cultivated on the Continent, and have houses built for their exclusive reception. Wendland was neat and careful in his habits, and gentlemanly in look and manners.

The public papers contain the following sad news:—On Tuesday, July 17th, the Steam Navigation Company's boat, the 'Eagle,' took up among her passengers from the Metropolis to the Isle of Thanet, a gentleman about fifty years of age, with his son, a youth of about thirteen years. When the boat got to the Lower Hope, below Gravesend, the gentleman was seen by the mate suddenly to fall from the sponsons into the river. The alarm was at once given, the steamer was stopped, and a boat was lowered to recover the unhappy man, but without success, and after remaining half an hour searching for him, the steamer proceeded on her journey, carrying with her the despairing son. It transpired that the unfortunate gentleman was named William John Salter, A.L.S., and that he resided at St. George's Road, Kilburn. He was by profession a geologist and botanical draughtsman.

We regret to have to announce the death of Dr. Carus, of Dresden, President of the Imperial German Academy Naturæ Curiosorum, and *ex officio* "Comes Palatinus Cæsareus."

AIRA FLEXUOSA, *Weihe*, IN ENGLAND.

By Hewett C. Watson, Esq.

The 'Journal of Botany' has shown the occurrence of this grass in Scotland and Ireland; and I can now add also to its habitats the third division of our triple kingdom, by reporting the species from North Hants. A single culm of it, without the root-leaves, has been in my herbarium upwards of a score of years, placed among my specimens of *Aira flexuosa*. The label bears no date, and gives only the long locality, "North Hants,—between Farnham and Farnborough," a line of way six or eight miles in extent. I walked with a friend from the one to the other place, soon after the Southampton (now, South-Western) Railway was in operation; so the probable station of the plant was somewhere about the present site of Aldershot Camp, which now covers much of the intervening space.

On reading Mr. A. G. More's account of his new locality for the plant, in Ireland, it seemed that Fleet Pond would be a suitable station for the grass; being an extensive pool of water, with adjacent bog or swamp, and situate only half-a-dozen miles westward from the road between Farnham and Farnborough. Accordingly I proceeded thither, and at once came upon the grass, within five minutes after leaving the railway at Fleet Station. It was there growing in the swamp among the usual plants of watery bogs. Further from the station, it was found under more easy conditions for access, being plentiful within a few yards of the open water of the 'Pond,' on ground apparently submerged in winter, but then (September 9) left uncovered by the sinking of the water-level in a dry summer. Its companions were *Eleocharis*, *Molinia*, *Myrica*, *Drosera*, *Carduus pratensis*, with other swamp-dwellers. I explain the locality thus fully by way of suggestion to botanists to examine other similar situations next season, and in any part of Britain or Ireland. As might be expected, the grass was mostly past its prime; but I secured examples enough to supply every member of the Exchange Club next winter; with some to spare, in case other botanists should care to apply to me for them. Earlier in the season (say July or August) thousands of specimens might have been obtained.

This *A. uliginosa* is truly very like *A. flexuosa*. Its claims to

specific distinctness rest on several slight differences, not on a single character only; and the situation of growth is very unlike the usually dry places in which the typical *A. flexuosa* prevails. I find their technical distinctions somewhat exaggerated in books, through the too usual practice of describing the opposite extremes, and neglecting the intermediate or approximating examples. Looking at specimens from France and Sweden, along with those from Hampshire, it would seem that the ligule gives the readiest practical character, being much longer and more acute, whiter and more membranous in the *A. uliginosa;* next, the seeming inequality of the two florets, through the longer pedicel of the second floret in *A. uliginosa*. As to the alleged differences between the leaves, the sizes of the flowers, and the erect or drooping panicles, I fear these are too slight and variable for much practical use in diagnosis. A considerable number of viviparous panicles were observed about Fleet Pond. I have seen *A. flexuosa* in that condition on our northern mountains; never so in South England, according to present recollection.

BRITISH ASSOCIATION, MEETING AT EXETER.

At the inaugural meeting, in the evening, Dr. Hooker, the outgoing President, having vacated the chair, it was then occupied by Professor Stokes, President-elect, who then proceeded to deliver his address, of which we give such extracts as may be of interest to our readers.

The President's Address.

Objects of the Association.

My Lords, Ladies and Gentlemen,—As this is the first time that the British Association for the Advancement of Science has met in the city of Exeter, and it is probable that many now present have never attended a former meeting, I hope the older members of the Association will bear with me if I say a few words in explanation of the objects for which the Association was instituted. In the first place, then, it aims at fulfilling an office which is quite distinct from that of the various scientific societies which are established in different parts of the country. These, for the most part, have for their leading object to make the voluntary labours of isolated workers in science available to

the scientific world generally by receiving, discussing, and publishing the results which they may have obtained. The British Association, on the other hand, aims at giving *a more systematic direction* to scientific inquiry, and that in various ways.

In a rapidly progressing branch of science it is by no means easy to become acquainted with its actual state. The workers in it are scattered throughout the civilized world, and their results are published in a variety of Transactions and scientific periodicals, mixed with other scientific matter. To make oneself, without assistance, well acquainted with what has been done, it is requisite to have access to an extensive library, to be able to read with facility several modern languages, and to have leisure to hunt through the tables of contents, or at least the indices, of a number of serial works. Without such knowledge there is always the risk that a scientific man may spend his strength in doing over again what has been done already; whereas with better direction the same expenditure of time and labour might have resulted in some substantial addition to our knowledge. With a view to meet this difficulty the British Association has requested individuals who were more specially conversant with particular departments of science to draw up reports on the present state of our knowledge in, or on the recent progress of, special branches; and the influence of the Association as a public body has been found sufficient to induce a number of scientific men to undertake the great labour of preparing such reports.

How the Objects are worked out.

By thus ascertaining thoroughly what we already had, what we still wanted was made more clear; and, indeed, it was one special object of the reports I have mentioned to point out what were the more prominent desiderata in the various subjects to which they related. The Association was thus the better enabled to fulfil another of its functions, that of organizing means for the prosecution of researches which require co-operation. When the want is within the compass of what can be accomplished by individuals, the demand may be left to create the supply; but it often happens that a research can hardly be carried out without co-operation. It may, for instance, require a combination of the most profound theoretical knowledge with the greatest experimental skill, or an extensive knowledge of very dissimilar branches of science;

or, again, the work to be done, though all of one kind, may be of such an extent as to be beyond the power of any one man. In such cases the limited power of the individual can only be supplemented by the principle of co-operation; and, accordingly, it becomes an important part of the business of the Association to organize committees for the prosecution of special researches. The researches thus undertaken at the request of the Association are published at length, along with the reports on the progress of science, in the first part of the annual volume.

In close connection with the last must be mentioned another mode in which the Association contributes to the progress of science. Many researches require not only time and thought, but pecuniary outlay; and it would seem hard that scientific men, who give their time and labour gratuitously to carrying out such researches, should be further obliged to incur an expenditure which they often can ill afford. The Association, accordingly, makes grants of money to individuals or committees for defraying the expenses of such researches. It appears from the Report which has just been published, that, reckoning up to the year 1867 inclusive, the sum of £29,312. 4*s*. 1*d*. has been voted by the Association for various scientific objects. Deducting from this the sum of £23. 16*s*. for the balances of grants not wholly expended, which were returned to the Association, we may say that £29,288. 8*s*. 1*d*. has been expended in the manner indicated. When we remember that these grants were mostly of small amount, and do not include personal expenses, and that very many of the researches undertaken at the request of the Association do not involve money grants at all, we may form some idea of the amount of scientific activity which has been evoked under the auspices of the Association.

In the address with which the business of the meeting is opened, it is usual for your President to give some account of the most recent progress of science. The task is by no means an easy one. Few, indeed, are familiar with science in all its branches; and even to one who was, the selection of topics and the mode of treating them would still present difficulties. I shall not attempt to give an account of the recent progress of science in general, but shall select from those branches with which I am more familiar some examples of recent progress which may, I hope, prove to be of pretty general interest. And even in this I feel that I shall have to crave your indulgence, for it is hard to be intelligible to some without being wearisome to others. . . . . .

Artificial Substitute for Madder.

A large part of the calicoes which are produced in this country in such enormous quantities are sent out into the market in the printed form. Although other substances are employed, the place which madder occupies among dye-stuffs with the calico-printer is compared by Mr. Schunck to that which iron occupies among metals with the engineer. It appears from the public returns that upwards of 10,000 tons of madder are imported annually into the United Kingdom. The colours which madder yields to mordanted cloth are due to two substances, alizarine and purpurine, derived from the root. Of these, alizarine is deemed the more important, as producing faster colours, and yielding finer violets. In studying the transformations of alizarine under the action of chemical reagents, MM. Graebe and Liebermann were led to connect it with anthracene, one of the coal-tar series of bodies, and to devise a mode of forming it artificially. The discovery is still too recent to allow us to judge of the cost with which it can be obtained by artificial formation, which must decide the question of its commercial employment. But assuming it to be thus obtained at a sufficiently cheap rate, what a remarkable example does the discovery afford of the way in which the philosopher quietly working in his laboratory may obtain results which revolutionize the industry of nations! To the calico-printer indeed it may make no very important difference whether he continues to use madder or replaces it by the artificial substance; but what a sweeping change is made in the madder-growing interest! What hundreds of acres hitherto employed in madder cultivation are set free for the production of human food or of some other substance useful to man! Such changes can hardly be made without temporary inconvenience to those who are interested in the branches of industry affected; but we must not on that account attempt to stay the progress of discovery, which is conducive to the general weal.

A New Opium Base.

Another example of the way in which practical applications unexpectedly turn up when science is pursued for its own sake, is afforded by a result recently obtained by Dr. Matthiessen, in his investigation of the constitution of the opium bases. He found that by the action of hydrochloric acid on morphia a new base was produced, which, as to

composition, differed from the former merely by the removal of one equivalent of water. But the physiological action of the new base was utterly different from that of the original one. While morphia is a powerful narcotic, the use of which is apt to be followed by subsequent depression, the new base was found to be free from narcotic properties, but to be a powerful emetic, the action of which was unattended by injurious after-effects. It seems likely to become avaluable remedial agent.

A "Mysterious Something."

But do the laws of chemical affinity, to which, as I have endeavoured to infer, living beings, whether vegetable or animal, are in absolute subjection, together with those of capillary attraction, of diffusion, and so forth, account for the formation of an organic structure, as distinguished from the elaboration of the chemical substances of which it is composed? No more, it seems to me, than the laws of motion account for the union of oxygen and hydrogen to form water, though the ponderable matter so uniting is subject to the laws of motion during the act of union just as well as before and after. In the various processes of crystallization, of precipitation, and so forth, which we witness in dead matter, I cannot see the faintest shadow of an approach to the formation of an organic structure, still less to the wonderful series of changes which are concerned in the growth and perpetuation of even the lowliest plant. Admitting to the full as highly probable, though not completely demonstrated, the applicability to living beings of the laws which have been ascertained with reference to dead matter, I feel constrained, at the same time, to admit the existence of a mysterious *something* lying beyond—a something *sui generis*, which I regard, not as balancing and suspending the ordinary physical laws, but as working with them and through them to the attainment of a designed end.

What this *something* which we call life may be is a profound mystery. We know not how many links in the chain of secondary causation may yet remain behind; we know not how few. It would be presumptuous indeed to assume that in any case we had already reached the last link, and to charge with irreverence a fellow-worker who attempted to push his investigations yet one step further back. On the other hand, if a thick darkness enshrouds all beyond, we have no right to assume it to be impossible that we should have reached

even the last link of the chain; a stage where further progress is unattainable, and we can only refer the highest law at which we stopped to the fiat of an Almighty Power. To assume the contrary as a matter of necessity is, practically, to remove the First Cause of all to an infinite distance from us. The boundary, however, between what is clearly known and what is veiled in impenetrable darkness is not ordinarily thus sharply defined. Between the two there lies a misty region, in which loom the ill-discerned forms of links of the chain which are yet beyond us. But the general principle is not affected thereby. Let us fearlessly trace the dependence of link on link as far as it may be given to us to trace it, but let us take heed that in thus studying second causes we forget not the First Cause, nor shut our eyes to the wonderful proofs of design which, in the study of organized beings especially, meet us at every turn.

Wholesome Effects of Scientific Inquiry.

Truth, we know, must be self-consistent, nor can one truth contradict another, even though the two may have been arrived at by totally different processes,—in the one case, suppose, obtained by sound scientific investigation, in the other case taken on trust from duly authenticated witnesses. Misinterpretations of course there may be on the one side or on the other, causing *apparent* contradictions. Every mathematician knows that in his private work he will occasionally by two different trains of reasoning arrive at discordant conclusions. He is at once aware that there must be a slip somewhere, and sets himself to detect and correct it. When conclusions rest on probable evidence, the reconciling of apparent contradictions is not so simple and certain. It requires the exercise of a calm, unbiassed judgment, capable of looking at both sides of the question; and oftentimes we have long to suspend our decision, and seek for further evidence. None need fear the effect of scientific inquiry carried on in an honest, truth-loving, humble spirit, which makes us no less ready frankly to avow our ignorance of what we cannot explain than to accept conclusions based on sound evidence. The slow but sure path of induction is open to us. Let us frame hypotheses if we will: most useful are they when kept in their proper place, as stimulating inquiry. Let us seek to confront them with observation and experiment, thereby confirming or upsetting them as the result may prove; but let us

beware of placing them prematurely in the rank of ascertained truths, and building further conclusions on them as if they were.

When from the phenomena of life we pass on to those of mind, we enter a region still more profoundly mysterious. We can readily imagine that we *may* here be dealing with phenomena altogether transcending those of mere life, in some such way of those of life transcend, as I have endeavoured to infer, those of chemistry and molecular attractions, or as the laws of chemical affinity in their turn transcend those of mere mechanics. Science can be expected to do but little to aid us here, since the instrument of research is itself the object of investigation. It can but enlighten us as to the depth of our ignorance, and lead us to look to a higher aid for that which most nearly concerns our well-being.

In the Biological Section the following papers have been read:—

"*Man and the Animals, being a counter-theory to Mr. Darwin as to the Origin of Species.*" By Archdeacon Freeman. The author said, "This question was one of the widest interest, and had become the battle-field of nations. In England opinion was divided. France was generally against the theory, and Germany in its favour. The only way to reply to Darwinism satisfactorily was to assert a counter-theory. It was suicidal to ignore in this inquiry the statements of the Bible. Mr. Darwin's theory was, that unity of type was explained by unity of descent, and that all living creatures had graduated one from another, and probably from one parent. Natural selection was only one means by which he believed this had been brought about. But had the plan of the universe aim or cause? Why should all the higher animals be so closely allied? Why should the beast have so many correspondences in structure with man? To these questions the Biblical record supplied an answer. According to the account given there, no sooner was the creation over and the Fall accomplished, than there appeared on the scene mysterious beings—the cherubim, whose name signified forms and figures. Now either these were made after the six days' creation in imitation of the animals, or, what was more probable, the animals were formed in imitation of them. To believe that all creatures were formed after pre-existent ideas in the divine mind was largely entertained by Plato. Thus, then, Scripture was seen to anticipate the conclusion of science, and to establish the pro-

found affinity of the higher creatures. The purpose of this affinity was to be found in the glory of God. The cherubim, the four typical creatures, ceased not, they were told, to give their Creator glory. Who could say there was no power in the lower animals, conscientiously it might be, also, to glorify God? If any one said this was a mysterious mode of treating the subject, what, he asked, could they have but mystery? The more mysterious the answer, the more likely it was to be true. Mr. Darwin's theory referred natural uniformity to a universal parentage, his to a universal pattern. Natural selection, under the latter, would still have its proper place. Dr. Darwin's view as to the origin of species was not necessarily irreligious, but his own facts upset it, showing that there was a special divine superintendence of the organic world." The Archdeacon in no way impugned the well-earned reputation of Mr. Darwin as an observer.

"*The Difficulties of Darwinism.*" By the Rev. H. O. Morris. In this paper it was contended that Mr. Darwin, in his book on the 'Variation of Species,' was guilty of a *non sequitur*,—his argument being that because many mere varieties had their origin in one common ancestor, all species were to be thus accounted for. Mr. Morris held that there was abundant evidence that when left to themselves, cultivated varieties of animals and plants returned to the original form, which if they had not been cultivated, they would not have lost. Mr. Darwin had never proved the creation of a new species. A number of quotations were made militating against the idea that man had arisen from a state of barbarism to one of civilization, and favouring the opposite theory that savage tribes were the product of degradations.

"*Philosophical Objection to Darwinism, or Evolutionism.*" By the Rev. Dr. M'Cann. The author urged that belief in evolutionism meant materialism, and the denial of the soul and immortality,—nay, even atheism. This he held to be proved by the writings of Professor Huxley. Philosophy had a right to be heard on this subject, not only on account of its importance, but because of the uncertainties of science. Dr. M'Cann then proceeded to assert his position; which was, that the affirmations of consciousness were unquestionable, and that anything that contradicted an affirmation of consciousness was false. Evolutionism did contradict many of these affirmations, and was therefore false. Evolutionism also denied responsibility and morality. He argued further, that the continuance of the non-selected forms, with

the total disappearance of the selected forms (if they had ever existed) was a fatal objection to the hypothesis, which was, moreover, opposed to all progress.

A very animated discussion then took place. The President remarked of the last paper that he was at a loss to see what it had to do with Darwinism. He had some doubt also as to the connection of the second paper with the subject.—Professor Huxley said he appeared to have been engaged in a perpetual battle since he had been in Exeter. The three papers were of very different characters. The second was one of which he did not propose to take any notice whatever. With regard to Dr. M'Cann's paper, he held that they should have the most intimate connection between science and philosophy; and in the name of philosophy he protested against such a shallow caricature of it as that of Dr. M'Cann. How could the latter impute to opinions which were essentially the same as those of Bishop Berkeley the conclusions which he did? Let him read Bishop Berkeley's writings—they were short. As to what he said about the affirmations of consciousness being necessarily true, did he not know that the foundations of the Cartesian philosophy had been snapped long ago? It was one thing to say that an affirmation of consciousness was absolutely certain, and another that any conclusion therefrom was also certain. He did not complain that Dr. M'Cann had caricatured him, because a man must understand before he could caricature, but he did complain that he had been misrepresented. He had written in a recent article that the freedom of the human will was the great question of the present day; and that he believed it would never be solved, because it lay without the domain of the human mind. It was not right, with that in print, to call him a necessitarian. Professor Huxley highly praised Archdeacon Freeman for his candour, though he denied his conclusions. He agreed with the Archdeacon in believing that the Bible was intended to teach physical science. The Archdeacon's ideas were not new, but constituted the philosophy of biology of Owen and Agassiz. It was a mistake to believe that the uniformity of type and plan were chiefly to be seen in the higher animals. It was to be seen as much in the lower, and was absent from none.—Dr. Hooker, who had also been criticized by Dr. M'Cann, said he had no course to defend himself but to read portions of his address to which reference had been made, and ask the meeting if they bore the construc-

tions put upon them. That he could not do, and he should therefore retire.—Dr. Wilkes considered Mr. Darwin a great observer, but by no means an inductive reasoner.—Mr. E. Vivian pointed out that all the old landmarks had been removed, and proceeded to make a few statements with regard to Kent's Cavern. He believed scientific and religious men differed in degree, and not in principle. There was no possibility of stopping short of man being contemporaneous with the fossil animals, and, in fact, preglacial. He had always believed that Moses had written a cosmogony, and he did not yet doubt that it would be in some way reconciled with science. There had been a very wide interchange of species, and when they admitted development they must have a number of separate acts of creation, of which there was no evidence.—Mr. Wallace did not consider that any one of the the papers ought to have been read in that place. If the opponents of Darwinism wished to come forward, let them bring either new facts or new arguments.—The President considered the most pertinent observations that had been made with regard to Darwinism came from Mr. Vivian. He had rightly said that the great difficulty was to account for existing animals. How were they to account for their difference from former ones? Either the elephant must be a spontaneous creation, or was the result of descent. Neither of the writers of the papers knew what Darwinism was, although really it might have been expected that they would have informed themselves about it before they wrote.—Dr. M'Cann explained that he had read the books to which Professor Huxley had referred, and said, moreover, that the question had been shirked.

"*On an Alteration in the Structure of* Lychnis dioica, *observed in connection with the Development of a Parasitic Fungus.*" By Miss Becker. While residing near Accrington, in Lancashire, Miss Becker was struck with the remarkable appearance of certain plants of *Lychnis dioica*, which, instead of the usual straw-coloured anthers, displayed a purple mark in the centre of the flower, giving the effect of a handsome dark eye. Further examination showed that, contrary to the usual habit of the plant, many of them were bisexual, each flower containing a pistil as well as stamens; except for the shortness of the styles, these pistils were as well developed as those of ordinary female plants. In 1863 she sent a few flowers to Mr. Charles Darwin, who, after submitting the flower to microscopic investigation, wrote, "The

dark purple anthers are a mass of some Cryptogamic plant, allied, I suppose, to the smut of Wheat. In the bud the pollen grains can be distinguished, afterwards they are wholly corrupted. There remains a pretty case of a reversion from a diœcious to a hermaphrodite condition." Subsequently he suggested that the plants might be natural hybrids. The impression crossed his mind that, the pollen being destroyed at an early period, the ovarium was developed in compensation. Miss Becker pursued her observations, and to account for the appearances she had two theories:—1. That the bisexual plants were cases of natural reversion to the original form, and that their association with the fungus disease was accidental. 2. That the parasitic fungus caused the flowers to assume the bisexual form. She maintained the last of the two to be the right one. Entering into many considerations in support of her view, she suggested that it might be an instance in illustration of Darwin's theory of Pangenesis. Dr. Dickson thought Miss Becker's theory unsupported by the evidence. Precedent disease of the *Lychnis* was the probable cause of the fungus growing in it.—Dr. Wilkes questioned the notion that a fungus parasite could help in developing the organs of a plant.—Professor Balfour, while acknowledging the excellence of the paper, disagreed with Miss Becker's conclusion. If Miss Becker was right, the instance was the first known to the botanical world.—Miss Becker replied cleverly. Perhaps it was the first instance, but why might not she make the first discovery of it? She was quite prepared to hear that they disagreed with her view, for, as far as she had observed, that section was remarkable for this, that everybody disagreed with everybody else. [Compare leading article in 'Gardeners' Chronicle,' Sept. 25, 1869, on this subject.—ED.]

"*On the Relative Value of the Characters employed in the Classification of Plants.*" By Dr. Maxwell T. Masters. This paper was devoted to the consideration of some of the means employed by botanists in elaborating the "natural" systems of classification, and to the estimation of the relative value to be attached to these means. The characters treated of were the following:—1, characters derived from the relative frequency of occurrence of a particular form, or a particular arrangement of organs; 2, developmental characters, whether "congenital" or "acquired;" 3, teratological characters; 4, rudimentary characters; 5, special physiological characters; 6, characters dependent on geographical distribution. Illustrations were given in explanation

of these matters, and for the purpose of showing their applicability to particular cases. In estimating the value to be attached to certain characters, it is necessary to consider the purpose for which they are required. If the object be synthetical—if we are seeking points of resemblance, so as to be enabled to group together a large number of forms into one or more large aggregates, stress must be laid, in the first instance, on the congenital characters as serving to bind together the greatest numbers; then on those dependent on frequency of occurrence and special physiological office, afterwards on such others as may be forthcoming. If the object be analytical and discriminative, the special physiological characters demand the first attention, then those which have the merit of frequency and invariability, and then those that are congenital. The systematist can very rarely act up to his own standard. Individual cases have to be treated on their own merits—philosophy has to be sacrificed to expediency, and herein shines the light of genius; the tact and insight of a first-class naturalist often lead him to make combinations, or to allocate forms, on what seem mere grounds of expedience, but which afterwards prove, when fuller evidence is gained, to be strictly consistent with philosophical views.

"*On the Law of the Development of Cereals.*" By Mr. F. F. Hallett. From continued observations and experiments, extended over nearly twenty years, Mr. Hallett said he had arrived at the following conclusions:—1. Every fully developed plant, whether of wheat, oats, or barley, presents an ear superior in productive power to any of the rest on that plant. 2. Every such plant contains one grain which, upon trial, proves more productive than any other. 3. The best grain in a given plant is found in its best ear. 4. The superior vigour of this grain is transmissible in different degrees to its progeny. 5. By repeated careful selection the superiority is accumulated. 6. The improvement, which is at first rapid, gradually, after a long series of years, is diminished in amount, and eventually so far arrested that, practically speaking, a limit to improvement in the desired quality is reached. 7. By still continuing to select, the improvement is maintained, and *practically* a fixed type is the result.

"*On the Flora of the Strait of Magellan and West Coast of Patagonia.*" By Dr. R O. Cunningham. The chief point of this paper was that, beginning at the eastern entrance of the strait and proceeding westwards to Cape Pillar and northwards through the channels ex-

tending to the Gulf of Perras, *three* distinct regions or areas may be recognized, each of which possesses a certain number of species of animals and plants peculiar to itself, as well as of a certain number common to its neighbours.

In the Chemical Section the subjects mentioned below were brought forward :—

"*On some New Substances extracted from the Walnut.*" By Dr. T. L. Phipson. Between the shell and the kernel of the Walnut there exists a thin membrane called the episperm, which closely envelopes the cotyledons, and is composed here, as in most other fruits, of a double membrane, the inner one being very thin, quite white, translucid, and perfectly devoid of taste, whilst the external one is much coarser in structure, more or less coloured, has a very bitter, disagreeable taste, and contains certain substances which formed the subject of this paper. From this membrane Dr. Phipson had extracted a substance which he called nucitannic acid, the most remarkable property of which is that when boiled with dilute hydrochloric acid it splits up into glucose and another new substance, called rothic acid.

"*On the Amount of Soluble and Insoluble Phosphates in Seeds.*" By Professor Crace Calvert. The Professor said that the results of various experiments he had made was that 100 parts of cotton fibre yield, when repeatedly washed with water, a quantity of acid phosphate of magnesia ; both husks and seeds also yield certain proportions. The results showed that the phosphates exist in much larger quantity in the seed than in the other parts of the pod. Experiments upon Wheat flour of various kinds showed that whilst the flour contains only a trace of the phosphates, especially soluble ones, the bran contains a large quantity. These facts tend to prove that the phosphates and the mineral matters contained in Wheat are not combined with the organic matter, but are in a free condition. Other investigations go to prove that although habit and pride have gradually led us to prefer white bread to brown, yet this is an error when we consider the nutritious properties of Wheat, especially as food for children, phosphates being essential for the formation of bone and blood.

NOTE ON *SAMBUCUS CHINENSIS*, *Lindl.*

BY H. F. HANCE, PH.D., ETC.

I pointed out in my 'Adversaria in Stirpes Criticas' (Ann. Sc. Nat. sér. 5, v. 217), that the character assigned to this species by De Candolle is erroneous,—the flowers being all hermaphrodite, and what Lindley took for females being merely abortive flowers, in the shape of fleshy, grandular, yellow, cup-shaped bodies, without a trace of either stamens or ovary, which increase somewhat in size, turn green, and then wither. I have since found that Professor Miquel (Fl. Ind. Bat. vol. alt. 124) had previously suspected the error; and he has, as I think, without sufficient reason, availed himself of the presence of these bodies, which are of no structural value, to found thereon his subgenus *Scyphidanthe.* He remarks on the closeness of *S. Chinensis* to *S. Javanica*, Reinw., which latter, again, Drs. Hooker and Thomson, in the 'Præcursores,' note as a native of China, without, however, adducing Lindley's name as a synonym. I have little doubt that the two are identical, for there is nothing in Miquel's character to show a difference. Junghuhn describes the fruit of the Java plant as yellow, Hooker and Thomson as black, whilst about Canton it is certainly red when ripe. A plant gathered by Maximowicz, at Yokohama, Japan, in 1862, and sent me from the herbarium of the St. Petersburg garden, under the name of *S. Thunbergiana*, Reinw. (which I cannot find published), is absolutely identical with the south Chinese one; but Professor Miquel, failing to recognize this identity, has, in his 'Prolusio Floræ Japonicæ,' described this as distinct, giving the name, however, as a manuscript one of Blume's, and not noticing the abortive flowers; he suggests a possible affinity with *S. Wightiana*, Wall., a species which, though described by Wight and Arnott, is omitted by Hooker and Thomson, probably through oversight, as no explanation is given. Though I believe Reinwardt's name of *S. Javanica* is the oldest, as he has possibly given two to the same plant, it seems preferable to fall back on that of Lindley. *S. ebuloïdes*, Desv., recorded from the neighbourhood of Canton, I have never seen.

I may here note that Dr. Williams informs me that my *S. Williamsii* is planted in the country around Peking to mark the boundaries of fields, and is known by the curious name, "kung tau lau 'rh," literally, "the old fellow that shows high-roads." He adds that it is very rarely met with in flower, being cut down for fuel.

NOTE ON *MELASTOMA REPENS*, *Desrouss.*

BY HENRY F. HANCE, PH.D., ETC.

The plant first described in Lamarck's 'Encyclopédie,' in 1797, under the above name, was transferred by De Candolle, in his revision of the family to which it belongs, to the genus *Osbeckia*.* M. Naudin, in his 'Melastomacearum Monographia Revisio,'† restored it to its original station, in which he was followed by Mr. Bentham.‡ Prof. Blume,§ just one year prior to the appearance of Naudin's memoir, formed it, *Osbeckia aspera*, and a few others, into the genus *Asterostoma*, with the observation, "Aliæ vero species ex Asiâ tropicâ, quo et complures *Osbeckias* ex Africa pertinere probabile, tam vegetatione quam conformatione calycis admodum conveniunt cum *Melastomate*, Burm., licet connectivo antherarum abbreviato et imprimis capsulis siccis apice loculicide dehiscentibus differant." Dr. Hooker, who spent many months in the thorough examination of the immense materials at Kew, and who has entirely recast the tribes and genera in this most intricate Order, simply remarks,‖ "Genus a Blumeo propositum *Asterostoma* nobis ab *Osbeckia* haud separandum videtur." I confess I am at a loss to understand the grounds on which this eminent botanist has arrived at such a conclusion, so far as *M. repens* is concerned, which I will add does not fall into the genus *Osbeckia*, as defined by himself. Of the only four species mentioned by name by Blume as appertaining to *Asterostoma*, *O. Manillana*, De Cand., and *O. aspera*, Bl., are included amongst *Osbeckia* by Naudin, who had examined authentic specimens, whilst *O. octandra* is placed amongst the *species incertæ*, and is by Dr. Thwaites** doubtfully quoted as a synonym of *O. virgata*, Don. *O. aspera* appears to me in every respect a genuine *Osbeckia*; with the other two I am unacquainted. The case is, however, widely different with regard to *O. repens*, De Cand., and Blume is altogether inaccurate in assigning to it an abbreviated connective and dry capsule. The stamens in this plant (and my observations are made on living specimens) are absolutely undistinguishable from those

* Prodr. Syst. Nat. Regn. Veg. iii. 142 (1828).
† Ann. Sc. Nat. 3 sér. xiii. 274. (1850. The title page has 1849, by mistake.)
‡ Fl. Hongkong. 114 (1861).
§ Mus. Bot. Lugd.-Bat. i. 50 (1849).
‖ Gen. Plant. i. 745 (1867).
** Enum Pl. Zeylan. 116 (1859).

of such typical *Melastomata* as *M. decemfidum*, Roxb., and *M. Malabathricum*, L., and of which a very good representation has been given by Wight;* the five longer ones have purple anthers and a connective longer than themselves, also purple; the base bicalcarate, and, as well as the filament, yellow; in the five shorter ones, the tips of the exappendiculate anthers reach as high only as the spurs of the longer ones, the locelli are transversely rugulose, and with the filaments are entirely yellow. With respect to the fruit, so far from being a dry capsule, it is a pleasantly-tasted, black, thoroughly succulent berry, when ripe, whilst the fruit of none of the other Chinese species ever become so at all, or are indeed more than fleshy in texture whilst ripening, and eventually quite dry, and would be more correctly described as "capsulæ primum carnosulæ, demum exsuccæ." The calyx-tube has simple sparse bristles, the lower portion formed of green cylindrical prolongations of the cellular tissue, on which are seated red bulb-like simple hairs. The laciniæ, too, though ciliate, are destitute of those penicilliform tufts characteristic of most *Osbeckiæ*. Naudin (loc. cit.) observes of the Chinese plant, "A cæteris *Melastomatibus* habitu discrepat, indole autem floris illis maxime congruit." The latter part of this sentence is strictly correct; with regard to the former, the plant is *sui generis*, differing quite as much from the upright twiggy *Osbeckiæ* as it does from the shrubby *Melastomata*, but it looks more like a dwarf member of the latter genus, from its broad leaves and the thicker texture of the petals. As Dr. Hooker places *Osbeckia* in a division of the tribe characterized by "antheræ æquales, connectivo vix aut non producto, inappendiculato," and assigns to the genus a "capsula," whilst he locates *Melastoma* in one distinguished by "antheræ inæquales, longiorum connectivo basi longe producto," and attributes to it a "bacca," it is manifest that the plant under consideration must be placed in the latter genus, and it is possible that Dr. Hooker, when writing as he did, overlooked the composite nature of Blume's untenable genus.

ON THE GENUS FREMONTIA.

There are certain plants which have an unfortunate history. *Napoleona* is one of these; no two botanists have described it in pre-

* Illust. Ind. Bot. i. t. 95.

cisely the same terms. *Fremontia* is another. The discrepancies arise from natural variations in the plants, but chiefly from the examination of imperfect material. The beautiful yellow-flowered shrub *Fremontia*, at present so little known in gardens, was first of all placed among the Mallows, till an examination of fresh not "mummified" specimens clearly showed the plant to belong to *Sterculiaceæ* and not to *Malvaceæ*. But even up to this time the plant is described as destitute of corolla (the yellow portion being considered as calyx). This view, however, is quite negatived by recent specimens, before us as we write, and in which there is a small five-leaved calyx outside the large yellow corolla. This calyx, however, or rather the greater portion of it, speedily falls off, and hence at first sight of a fully developed flower there appears to be no calyx. The stamens are opposite to the sepals and alternate with the petals,—a circumstance which might have suggested the notion that the yellow segments were truly petals. The early shedding of the calyx is due to the formation of a very large quantity of thin-walled oblong cells, which readily disintegrate, allow the sepals to fall off at the slightest touch, and leave exposed a quantity of white mealy material. The same thing takes place even in a more marked degree in the base of the column of stamens, which becomes ultimately detached from the base of the petals. There seems to be some difficulty in the propagation of the *Fremontia*, which is the more to be regretted, as it is calculated to be one of the brightest ornaments of the shrubbery.—*Dr. Masters in 'Gardeners' Chronicle.'*

THE NORTHERN LIMIT OF EDIBLE BERRIES.

In a series of maps on physical geography, published by the National Society, there is one by Dr. A. Petermann, showing the distribution of the most important fruits over the globe. In most parts of the map, a line describing the northern limit of edible berries is laid down considerably below the frigid zone, while I find, by referring to specimens in herbaria, that it is above the Arctic circle, and runs almost parallel with latitude 72° N. Beyond that boundary no plants with succulent fruits, no members of the genera *Rubus*, *Cornus*, *Empetrum*, *Vaccinium*, and *Oxycoccus*, seem to grow; and it is stated that in Lapland, during some summers, berries do not ripen. The only berry-bearing

plant which I have seen from a station considerably above that limit is *Vaccinium Vitis-Idæa*, which Capt. W. Penny gathered in Bushnan Island, on the N.W. shores of Greenland, in latitude 76° N., long. 66° W. Possibly there may be some mistake about the locality, as no other expedition has brought home the Cranberry from so high a latitude. If, therefore, to settle the question, Arctic explorers will but collect the leaves of any berry-bearing plant, however sour, bitter, or insipid the fruit may be, they would confer a benefit upon geographical botany.

It may be asked, at a time when renewed efforts are being made to explore the Arctic regions, Does vegetation extend as far north as the pole itself? I answer, Yes; if there be land, there are also plants. It is known that excessive cold during the winter exercises but a limited influence upon a vegetation which, like the Arctic, enjoys the protection of a thick covering of snow, and is besides in a state of inactivity. The temperature of the summer, the months of July and August, has by far the greatest share in the distribution of vegetable life in the northern regions. Now the lowest temperature during that time is not to be found in the most northern point as yet reached by any expedition, but in Winter Island, on the eastern shores of Melville Peninsula, where the mean monthly temperature in July and August ranges between 34° and 36° Fahrenheit. That spot, which may be called the phytological pole, is covered with vegetation; and knowing as we do that plants do grow, not only in a soil frozen underneath, but also (as in the Kotzebue Sound) on the top of icebergs, there is no reason to suppose that the terrestrial pole is destitute of plants. —B. Seemann.

VEGETATION OF LORD HOWE'S ISLAND.

By Charles Moore, Esq.

I have lately had an opportunity of visiting Lord Howe's Island, which lies off our coast (Sydney) some 300 miles. It is small in extent, and scarcely known to any but navigators. A few observations relative to the botany of the place, may therefore be interesting to your readers. The island is situated in lat. 31° 36′ S., and long. 159° 5′ E.

It is somewhat semicircular in form, about 4½ miles in length, and 1¼ miles at its widest part. On its southern extremity there are two mountains, over 2500 feet high; from the base of these to the northern end, where the ground again rises to an elevation of about 1200 feet, the intervening space is of a low, undulating character. The whole of the island is densely covered with a vegetation mainly consisting of trees, shrubs, and Palms, there being no barren spots upon it, excepting the precipitous cliffs of the mountains and coast. From this description of its size and breadth it will be apparent that the greater part of the island is subject to the effects of the sea breeze; yet, on the southern and most exposed side, Palms and exogenous trees grow down to high-water mark, and, except in being dwarfed, seem to be otherwise entirely unaffected by exposure.

After passing the first belt of trees, a species of Fig (*Ficus*) abounds, and occupies much of the low-lying grounds. In general appearance it greatly resembles *F. macrophylla* of our eastern coast. It differs, however, from that plant by its smaller fruit and foliage, by the underpart of the leaves being more ferruginous, and by its great tendency to produce adventitious roots from its branches, which, after reaching the ground, become stem-like, so that in many instances it is difficult to determine the original trunk. In this respect it is the most remarkable species of *Ficus* I have met with in this part of the world. The largest tree of the kind which I noticed was, as nearly as possible, about 100 yards from the extremity of the branches on one side to that on the other, and had very numerous root-stems. It was a glorious sight, and one long to be remembered. In two or three instances these trees were found forming, as it were, a circle round an open space. This, it was plain, was caused by the original tree dying off entirely in the centre, and its branches in consequence becoming so many separate individuals. It is called Banyan by the settlers, after its great prototype of Indian notoriety. No other species of *Ficus* was observed.

Among these Figs, and in every situation upon the island, whether high or low, to the extent of my investigations, two similar, but very distinct species of Areca Palm abound, one of which is called by the settlers the Cabbage, or Thatching Palm, from the fact of its fronds being the only material used for thatching upon the island. This is managed by the base of the foot-stalk of the frond doubling just below the pinnæ, at which point it is worked on a batten, secured in the roof

for this purpose. The stalks are brought rather close together on the inside, forming a row of ribs, which has a somewhat neat appearance, and the feathery spray, or pinnæ, on the outside, become an outer covering, of from 7 to 8 inches in thickness, rendering the interior impervious to wet, and cool and comfortable to the inhabitants; it will last from eight to ten years. The other Palm, equally abundant, and intermixed with the one just noticed, is not used for any special purpose. It is of a more slender habit, having shorter and more arching fronds, with the pinnæ rising from the rachis instead of falling as in the former, giving it a rather peculiar appearance, from which it is called by the settlers the Curly Palm. Both of these produce very large quantities of fruit, the drupe being of an ovate form, about 1 inch in length, and both have simple spadices (the latter having the longest), produced from among and below the lower fronds. The seeds of both kinds are eaten with the greatest avidity, and are, indeed, the principal support of the large bodies of settlers' pigs, running in most parts of the island.

At an elevation of about 1500 feet, nearly the limit of the preceding species, another and very beautiful Palm occurs, called the Umbrella Palm by the settlers. It has large pinnate fronds, with a branching spadix, bearing a large plum-like fruit, which is of a reddish colour when ripe. This tree is comparatively rare, and is strictly confined to the sides of the two high mountains, on the tops of which another and smaller species of Palm than any of the preceding kinds is said to grow in very great abundance, the fruit yielding the chief food of the wild pigs running about in that part. I speak of this Palm only from hearsay, as neither I nor any of the party who visited the island with me succeeded in reaching either of the mountain tops. The settlers, who frequently go there to hunt wild pigs, describe it as comparatively low in stature, and bearing a profusion of roundish-shaped fruit. This island, therefore, though very small in extent, produces four distinct species of Palms, none of which, I think, are described.

Among other endogenous plants, those chiefly remarkable are two species of Pandanus; one, found principally near the coast, with a stout, straight stem, bearing from its sides a small number of the usual root-like supports; the other having a much more slender stem, and, from an early stage, supported by other very numerous, slender, stem-like roots, which are borne to a very considerable height, up to a point

where the stem branches off. The general appearance of this tree, which frequently attains a height of from 40 to 50 feet, is very singular indeed: the whitish-coloured root-like bodies, or forked, adventitious stems, occupying as much space below as the branches do above, and thus making the tree resemble an hour-glass. This is a more inland plant than the former, and grows up to a very considerable elevation.

The next and only plant of this class of any particular interest belongs to *Iridaceæ*, and is found only in two or three parts of the island, and that sparingly. One is puzzled to think how such a plant could be indigenous to this quarter of the world, so far distinct is it from most of its congeners. Seed vessels only were obtained, which resembled those of the genus *Moræa;* the flowers were not seen, but from the description given of them by the settlers, who call them the "wedding flowers," they would be referable to the genus named; the leaves of the highest plant obtained were about 6 feet in length, and 3 inches wide at the broadest part.

Crinum pedunculatum was abundant in many parts of the moist sandy shores; it was the only Amaryllid noticed. Orchids were rare, only two kinds being seen; one, a species of *Dendrobium*, grew sparingly upon Figs, and in rocky, shady places; another, a species of *Sarcochilus*, was observed attached to trees high upon the hillsides. The Grasses were equally scarce, only three indigenous kinds being gathered, viz. *Spinifex*, running along the sands of the coast; a *Chloris*, and a *Polypogon*, the two last only in one or two places in the interior. In all the clearances made by the settlers not now in cultivation, our Couch Grass, *Cynodon Dactylon*, and our Tufty Grass, *Sporobolus elongatus*, both evidently introduced, have taken possession of the ground. A single species of *Carex*, a *Cyperus*, and a *Lamprocarya*, are all that represent the Order Cyperaceæ, while *Juncus maritimus*, *Smilax latifolia*, and a Commelynaceous plant are the only other endogenous plants observed.

It would occupy too much space, and would be out of place in this sketchy description of the botany of the island, to enumerate all the exogenous plants collected; I shall, therefore, confine myself to those which grow in the greatest abundance, and which mainly characterize the vegetation, namely, *Lagunaria Patersoni*, an Australian as well as Norfolk Island plant; an *Ochrosia*, remarkable for the abundance of its deep red-coloured fruit and bright green foliage; two species of

Acronychia, *Olea paniculata*, a *Pisonia*, allied to *P. Brunoniana*, a *Tetranthera*, a *Maba*, a *Myoporum*, *Baloghia lucida*, and an unknown *Myrsinaceous* tree, bearing large quantities of a small oval, reddish fruit, and singular as being the only tree on which was found the very curious parasite *Viscum distichum* (Bauer, Illustr.). This grew only on the extremities of the top branches, and had the effect of apparently destroying altogether some of the trees on which it had fastened itself. These plants, with the *Ficus* referred to in the early part of this paper, constitute at least three-fourths of the trees and shrubs in the island. The *Myrtaceæ*, which might naturally be expected to have been strongly represented upon an island so contiguous to the Australian coast, were confined to a small species of *Melaleuca*, called by the settlers "Kilmoque," and used by them as a substitute for tea; and an arborescent species of *Leptospermum*, very rare indeed, as only one tree of the kind was found, which was dead, and had seed vessels only upon it. *Proteaceæ* were altogether wanting, and not a type of the Australian *Leguminosæ* was found, this Order being here confined to *Edwardsia*, *Guilandina*, and *Canavalia*. A single Epacrid was obtained, and this at a high elevation, being a tree of from forty to fifty feet in height, with a stem two feet in diameter at the base, and described to me by my companion, who found it, as very branching in habit, and destitute of leaves, except at its extremities, where the foliage became closely imbricated and bunchy in appearance, surrounding terminal panicles of flowers, causing a resemblance, as he observed, of so many small Pine-apple plants. Some of the uncultivated ground, and many other waste places, were entirely taken possession of by *Verbena Bonariensis*, the Castor-oil plant, the Cape Gooseberry, and *Solanum laciniatum*, the Kangaroo-apple of our colonists, all of whom may be considered the troublesome weeds of the settlers.

I have now only to notice the Ferns, which are confined to the following genera, viz. *Polypodium*, *Pteris*, *Nephrolepis*, *Asplenium*, *Platycerium*, *Litobrochia*, *Neottopteris*, *Diplazium*, *Davallia*, *Trichomanes*, *Dicksonia*, *Alsophila*, and *Marattia*. Of these, the only strictly arborescent kinds were two species of *Alsophila*, one the well-known *A. excelsa*, the other a black, slender-stemmed species, which, I think, will prove to be as yet undescribed. The genera *Adiantum* and *Aspidium*, both so general in Australia, Norfolk Island, and New Zealand, were not observed; but *Tmesipteris*, so nearly allied to Ferns, and

common to all these countries, was found here in many places. The other branches of Cryptogamic botany I had no time to investigate, but the Mosses and *Jungermanniæ* were comparatively scarce. Lichens, particularly the larger kinds, such as *Parmelia* and *Sticta*, were very frequent on both rocks and trees on the higher grounds. Along the coast, and washed ashore, were numerous kinds of Seaweed, but they appeared to be principally small fucoid forms, intermixed with a few filamentous kinds.

To those acquainted with the botany of Australia and adjoining islands it will be apparent, from the sketch here given, that the plants at this island more nearly resemble those of Norfolk Island, from which it is distant some 500 miles, than those of any other country. The *Leptospermum* and *Melaleuca* are almost the only plants which link its flora with that of Australia, all the other kinds being chiefly types of genera found on Norfolk Island. This resemblance will be more clearly indicated when, at some future time, I shall give a detailed account of all the plants observed and collected during my three days' sojourn upon this interesting little island.—*Gardeners' Chronicle.*

NEW PUBLICATIONS.

The British Rubi; an Attempt to discriminate the Species of Rubus known to inhabit the British Isles. By Professor BABINGTON. London: Van Voorst. 1869. 8vo, pp. 305.

Essai Monographique sur les Rubus du Bassin de la Loire. Par L. GASTON GENEVIER. Angers: Imprimerie Lachese. 1869. 8vo, pp. 343.

The two last years have been fertile in Bramble literature; for besides the appearance in Germany of Kuntze's 'Reform Deutscher Brombeeren,' both in England and France the two botanists who have devoted themselves to the monographic study of the Brambles of their respective countries, have both published, in full detail, the result of their labours.

It is now more than a quarter of a century since Professor Babington first treated upon the British *Rubi* in the original edition of his 'Manual,' and twenty-three years since he elaborated them fully in his

'Synopsis.' The changes which have been made, from time to time, in the six successive editions of the 'Manual' show that he has steadily kept the genus under observation. The present work may be regarded as a new edition of the 'Synopsis,' considerably enlarged in plan, and of course brought up to the present level of the author's knowledge and opinions. It was intended to have been accompanied by a set of quarto plates, but as the preparation of these has been, by unavoidable circumstances, much delayed, it is purposed that they shall appear when ready as a separate work. As regards arrangement, species limitation, and nomenclature, the work does not offer any alteration, as compared with the two last editions of the 'Manual;' but whilst in the latter we have the bare diagnoses, we have here a table showing the distribution of the species through the geographico-botanical provinces of the island, an historical sketch of the progress of the knowledge of the genus in this country; a general sketch of the variation in character which we get within the bounds of the genus; a table showing, *in extenso*, the literature of the subject, and under each species besides a Latin diagnosis, and a complete characterization in English, a full list of synonyms with explanations respecting them, and a list of special stations arranged in geographical order. It is a thorough and exhaustive explanation of the result of the work which the author has bestowed upon the genus since he first took it in hand, and of course needs no recommendation of ours to help it to fall into its place as the standard handbook to be used by all who wish for information on the subject.

M. Genevier, though he belongs to a younger generation of botanists than Professor Babington, has devoted himself to the study of the Brambles of the centre and west of France for nearly twenty years. He learnt his botany at Angers, under Professor Boreau, and afterwards settled in medical practice at Mortagne-sur-Sèvre, in Vendée, but has recently removed to Nantes. Though he has had a monograph of the *Rubi* of his field of study sketched out for the last dozen years, he has only issued two or three short papers in the 'Memoirs of of the Société Académique d'Angers,' and now gives to the public, for the first time, the detailed result of his observations. His work consists almost solely of detailed descriptions, extending on the average to more than a page each, of 203 forms which he admits to specific rank, the characters upon which he relies mainly for distinguishing them

from one another being indicated by means of italics, and the descriptive portion of the work being followed by an analytical key, constructed upon the same plan as those given in Boreau's 'Flore du Centre.'

The point suggested by the works upon which we feel most inclined to remark, is the question of what is the proper rank in the scale of nature, and what the relationship to each other of the individualities characterized in them. Since Weihe and Nees von Esenbeck published the 'Rubi Germanici,' the authors of floras and monographs for tracts of country in Central and Western Europe fall easily into three sets, in the plan they have followed in dealing with Brambles. First come those who, like Koch and Bentham, treat *Rubus fruticosus* as a single undivided species. The second and most numerous class follow Weihe and Nees in admitting and characterizing a comparatively limited number of so-called species. To this second class belong Arrhenius and Fries in Scandinavia, Dumortier in Belgium, Wimmer and Von Garcke in Germany, Godron in France, and Mercier in Switzerland; and in Britain Professor Babington having made his *début* as a fair average representative of this class, has in no way changed his position through the course of his successive writings, his present work, as regards the general plan of species-limitation, being quite in accordance with the Synopsis of 1846. And we have a third class of authors to which belong P. J. Müller and Wirtgen (as tested by his fasciculus) in Germany, and which, by his present work, M. Genevier represents for France, who acknowledge and define a very much larger number of what they also call "species."

The following passage will show clearly in what light M. Genevier, as representing the third class, regards the species which he has established and characterized.

"In the introduction to his 'Diagnoses' of new and misunderstood species," M. Jordan says, "We have not in our researches quitted for a single instant the domain of positive reality. It is not theories, but material facts that we have to furnish; it is not a certain manner of viewing things, or a particular opinion that we are going to express, but facts well and duly proved by the ordinary process of experience that we proceed without fear to submit to the examination of all friends of science. We have simply to unfold that which we have seen, experimentalized upon, proved, that which even those who are

the most disposed to contradict us, might have seen and proved, like us, or better than us, if they had devoted themselves to the same inquiries with materials similar to ours. We have not been able to resist the desire to quote these words of the learned author of the 'Icones,' which indicate, much better than we could have done, the point of view in which we have placed ourselves to study the genus *Rubus*, of which we have undertaken the history." (Genevier, 'Essai,' pp. 1–2.)

Taking Professor Babington as a representative of the second class, we find that he also, unless we greatly mistake his meaning, holds that the "species" which he adopts or establishes are (excluding mistakes arising from imperfect information which fuller inquiry will rectify) individualities of an absolute character bounded by nature with a line of strict limitation. The rule which he lays down, or general principle of species-limitation which he enounces, is as follows:—

"If a Bramble is found to retain the same appearance, under different circumstances of soil and exposure, although many of its characters vary considerably, we may conclude that it is a true species and form some idea of its range of variation." ('British Rubi,' p. 19.)

To this any botanist who represents the first or third class immediately objects. "If it varies considerably under different circumstances it does *not* retain the same appearance," and the Müllerian asks, "By what rule, other than by a measure fixed arbitrarily in your own mind in each special case, do you unite together under one name as a single 'it,' half-a-dozen or a dozen forms which I can undertake to distinguish?" To this inquiry we do not think that Professor Babington could return any answer that would satisfy an unprejudiced umpire. For our own part, we can only say that we heartily wish,—that, at any rate it would save an enormous amount of trouble,—if he had in this work and his other writings on this subject, and if the numerous writers of the class which he represents had as firm ground under their feet as they seem to think that they are standing upon; but we cannot admit that the ground is firm, for this reason, amongst others, that after having examined authenticated specimens of every one of Professor Babington's species, and studied most of them in a growing state, we have had the opportunity of comparing with M. Genevier's work, a large collection of English and French specimens labelled by the latter, and that we cannot see that the 203 species in the one case,

individualized and defined in perfect good faith as the deliberate result of the labour of many years, cover a wider range of form, or a materially greater degree of variability within that range, than the 43 species in the other, individualized and defined with a sincerity and an amount of labour which every one in England, who knows anything about the matter, is fully prepared to appreciate.

The one point on which we have felt disappointed in Professor Babington's work is, that he says so little about the result of his experiments in cultivating *Rubi*. His only material allusion to the matter is an entirely general one, "More than forty of the supposed species have been raised from seeds in the Cambridge Botanic Gardens, and the produce has not varied in form or characters from the parent plants." As bearing upon his plan of species-limitation we should have liked very much to know, in exact detail, which are the plants to which he here alludes, and for how many generations each of them has been reproduced. But as the matter stands, we cannot form the slightest idea to what extent he has been guided by the result of his experiments in planning out the rank of the forms.

Holding, as we have just indicated, that into whatever number of portions the original *Rubus fruticosus* be subdivided, they cannot possibly be separated and characterized as absolutely limitable individualities, we would strongly recommend to our rising generation of collecting botanists the study of the *Fruticose Rubi*, as furnishing one of the best means within their reach of gaining sound conclusions on the nature of species. Let them in the first place, leaving books and names altogether on one side, gather some autumn the forms which grow in the neighbourhood where they live, and try to reckon up meanwhile how many they can individualize, and note down what are their distinctive marks. After having done this, let them take Professor Babington's book and get access to a set of specimens named authentically after it, and compare their own specimens and notes with these. And then, if possible, let them, another autumn, visit some other neighbourhood, and pursue there the same process that they followed at home; and we feel confident, if they do this with reasonable care, that whatever be their after botanical experience, they will find their time has not been wasted.

Vegetable Teratology: an Account of the Principal Deviations from the usual Construction of Plants. By MAXWELL T. MASTERS, M.D., F.L.S. With numerous Illustrations by E. M. Williams. London (Ray Society): 1869. Pp. 534.

An immense quantity of matter relating to the abnormal conditions so frequently met with in plants has been written, and Dr. Masters has done a good and useful work in concentrating it by a judicious selection of those facts "which seemed intrinsically the most important or those which are recorded with the most care." He has embodied these in the volume before us with his own numerous observations and those of many correspondents.

No English work specially devoted to the subject has been hitherto published, with the exception of Thomas Hopkirk's 'Flora Anomala,' a small book printed so long ago as 1817. On the Continent, however, several treatises of more importance have appeared, though none so comprehensive in scope as the book under notice, which is undoubtedly the best on the subject. One good result which may be expected to accrue from its publication is a diminution in the repeated descriptions in the journals of well-known malformations—such as monstrous forms of Plantain, *Cardamine pratensis* or *Trifolium repens*—by students and amateurs to whom, as Dr. Masters remarks, Teratology "seems always to have presented special attractions" and owes "a large number of its records," but who are prone, as a class, to consider all observations of equal value, whereas as the author shows, "the frequency of a particular change in one species . . . may be so great as far to exceed the instances of its manifestations in all the rest put together" (p. 488).

Dr. Masters's book is eminently a record of facts, and their arrangement is a matter of some importance. Teratology being defined to be "the history of the irregularities of growth and development, and of the causes producing them," the most philosophical mode of grouping the various conditions met with would seem to be one depending on those causes, a plan Dr. Masters thinks impracticable. This is probably true in our present ignorance of them, and so another method suggests itself, viz. according to the organs affected. This arrangement is not adopted as it "has only convenience to justify it," but it may, perhaps, be said that in the existing state of knowledge of the subject conve-

nience of reference might well be made a primary object. An arrangement by organs would also have done away with a considerable part of the repetition which is a somewhat marked feature of the volume, though under any treatment some repetition is unavoidable, as several deviations from customary structure frequently coexist.

The author arranges all abnormal conditions under four great primary heads :—1. Deviations from ordinary arrangement; 2, from ordinary form; 3, from ordinary number; 4, from ordinary size and consistence. Under the first head are included cases of unusual cohesion and adhesion, of fission, dialysis, and solution, as well as the numerous forms of prolification and the production of adventitious organs. In the second class are placed examples of the persistence of early conditions (stasimorphy), incomplete or excessive development (including regular and irregular *Peloria*), and the various kinds of metamorphy of organs or perversions of development, including the usual conditions in double flowers, as well as many deformities and irregularities not due to disease or parasites. In the third division we find cases of multiplication of parts, and of diminution or non-development, whilst in the fourth are grouped enlargements (not pathological), outgrowths (enation), atrophies, and degenerations. Under each of the smaller sections the examples are arranged in an anatomical series, and lists are often given of the species particularly subject to the anomaly under observation; bibliological references are copiously inserted, and show how extensive is Dr. Masters's acquaintance with the literature of his subject, and how desirous he is to give accurate information.

The chief object of the study of "monsters" is, as was long ago discerned by Bacon, to obtain light on the true nature of ordinary productions. This is kept in view throughout the book; indeed the author urges the claims of teratology to be considered of equal importance with the study of development, in framing a true morphology, since the laws regulating the two are the same. "Already," he says, "teratology has done much towards showing the erroneous nature of many morphological statements that still pass current in our text-books. . . . Thus organs are said to be fused which were never separate, disjunctions and separations are assigned to parts that were never joined, adhesions and cohesions are spoken of in cases where, from the nature of things, neither could have existed" (p. xxxiv.). It must, however,

be allowed that fallacies are much more likely to be found in teratological data than in the more definite and orderly conditions met with in developmental investigations. Considerable light would probably be thrown on morphology by a careful study of the early condition of abnormal organs and their phases of development.

We think Dr. Masters, however, might well have introduced somewhat more inferential speculation than he has done; his short and scattered remarks on morphological subjects are of so much interest that one cannot but feel the want of more similar matter. Suggestive notes, however, on the nature of the so-called inferior calyx, of the placenta, the ovule, and some other organs, the homological nature of which is still an open question, will be found in the body of the work, and are again alluded to with other matters in the "general conclusions" at the end of the volume.

We cannot praise the figures; absence of artistic beauty is of secondary importance, but vagueness is shown in some of them, especially in regard to the relative position of organs, which lessens their utility; in those made from the author's own sketches, the fault rests with the engraver.

An excellent Index supplies copious references not only to subjects, but also to the various species mentioned.

BOTANICAL NEWS.

The British Association has not been productive botanically. The President delivered a carefully-worded anti-Darwinian address, the effect of which will, however, be neutralized by that of the incoming Darwinian President, Professor Huxley. The anti-Darwinian papers read were as feeble as they were unscientific, and they were justly treated as a good joke. Darwinism must be attacked by a very different class of arguments from those heard at Exeter.

We learn with pleasure that Mr. M. C. Cooke is engaged in the preparation of a 'Handbook of British Fungi,' which will contain figures illustrating the principal genera, and references to those of the species. Intending subscribers should communicate with Mr. M. C. Cooke, 2, Junction Villas, Upper Holloway, London. The subscription price is half-a-guinea.

M. Alphonse de Candolle sends us his reply to the various objections that have been raised to his 'Laws of Botanical Nomenclature,' a reprint from the 'Bulletin' of the Botanical Society of France. If this paper is going to be translated into English, we trust it may be done in such a manner as not again to impose upon us the necessity of either passing over these laws in their foreign

dress in silence, or using terms in speaking of the rendering which might offend those with whom we have every wish to stand well.

On the 14th of September, the centenary of Humboldt's birthday was celebrated in many parts of Germany, though it was much to be regretted that so great a name was here and there made the watchword of political and religious parties. But it could hardly be expected that all should cordially join in celebrating the birthday of a man who has only just passed away, who held such advanced views as Humboldt did, and who was so fond of indulging in criticisms. A whole generation should have been born and buried before any celebration of the kind ought to have been attempted.

Of Von Krempelhuber's 'History and Literature of Lichenology, from the Oldest Time to the year 1865,' the second and concluding volume has appeared. It may be ordered from the author (3, Amalien Strasse, Munich; or through Williams and Norgate). The work has been printed at the author's risk and expense, and is the result of much careful research and labour.

From Vienna we receive an acceptable reprint of Dr. A. Engler's 'Index Criticus Specierum atque Synonymorum Generis Saxifragæ,' which first appeared in the 'Transactions' of the Zoologico-Botanical Society of that place. It fills forty-four closely printed pages, and cannot fail to be highly useful to the working, systematic botanist. The author accepts 167 species of the genus, distributed under 17 sections.

A scrap of botanical news, published in our August number, that "we had received full and authentic particulars respecting the share which Dr. Hooker is alleged to have had in preventing certain honorary distinctions being conferred upon some Englishmen who visited the great Horticultural Exhibition at St. Petersburg," has, we regret to learn, been misinterpreted. So far from wishing to imply censure, we held (though this may appear a gratuitous remark) that the illustrious botanist acted in a manner of which all right-minded men could not help approving.

We have to welcome the appearance of Trimen and Dyer's long-expected 'Flora of Middlesex' (Hardwicke), and Dyer and Church's edition of S. W. Jonson's 'How Crops Grow' (Macmillan).

Dr. Arthur Schott we have to thank for sending us a set of his 'Phytographical Glimpses of the Tropics of America,' illustrating the vegetation of Yucatan and New Granada.

Next year will see the production of an illustrated work on new and rare British Hymenomycetous Fungi from the pen of W. Wilson Saunders, F.R.S., and Worthington G. Smith, F.L.S. It will consist of descriptions and figures of some 200–300 species. 100 coloured plates (super-royal in size) are being drawn on stone by Mr. Smith, partly from original drawings by Mr. Saunders and partly from his own. Many of the species are unpublished, and others new to science. Subscribers may send their names to Mr. Van Voorst. The book will appear in four parts, each containing five Plates, price 10*s.* Any rare species would be thankfully received by Mr. W. G. Smith, 12, North Grove West, Mildmay Park, London, N.

The next number of this Journal will contain a double Plate; no illustration is issued with this.

Tab. 96 & 97.

H Trimen analys. W G Smith del et lith

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ON THE GIGANTIC NEW AROIDEA FROM NICARAGUA. (*GODWINIA GIGAS, Seem.*)

By Berthold Seemann, Ph.D., F.L.S.

(Plates XCVI. and XCVII.)

This is the largest Aroid, both in leaf and flower, of which we have any knowledge. It was discovered in January, 1869, near to Javali Mine in the Chontales Mountains of Nicaragua, where it grows in broken ground near rivulets (*quebradas*) amongst brushwood. I have never seen it in any other part of tropical America, but from information lately received, I am led to believe that this, or a plant very much like it, is found in the mountains of neighbouring Central American Republics.

The root-stock with its whorl of roots, turned topsy-turvy, much resembles an old man's head, bald at the top; in the two specimens dug up it was 2 ft. 2 in. in circumference, and weighed from 90 to 92 ounces. There are no roots whatever in the lower part of the corm, which is perfectly smooth and white; all are placed in a whorl around the top, and between them many young corms, by which the species propagates itself, are nestling. The plant has only one leaf at a time, and after that has died off, the flower spathe makes its appearance, both being of gigantic dimensions. The petiole (of the largest specimens measured in Nicaragua) is 10 ft. long, and 10 lines in circumference, covered with minute spiny projections, and with a metallic beautifully mottled surface (brimstone-yellow, barred and striped with purple), giving it the appearance of a snake standing erect. The blade of the leaf (which is green on both sides) is 3 ft. 8 in. long, so that the whole leaf is 13 ft. 8 in. long (Engl. measurement). The blade is divided into three primary sections, which are again repeatedly subdivided, the extreme divisions being ovate-acuminate. The peduncle is 3 ft. long and 4 in. in circumference, mottled, and with minute spiny projections as the petiole, and furnished towards the base with several large bracts. The flower-spathe is the greatest curiosity, measuring as it does, 1 ft. 11 in. in length, and 1 ft. 8 in. in width. It is of a thick, leathery texture, outside of a dark bluish-brown, and inside of a dark brownish-red, with the exception of the base and those parts surrounding the spadix, which are whitish-yellow. The spadix is only 9 in.

long, and 9 lines across, and bears hermaphrodite flowers, the technical description of which is given below.

The plant grows with great rapidity—several inches during a single night,—and the flowers emit the odour peculiar to many Aroideæ and other dark-coloured flowers. The plant has nothing to do with *Amorphophallus* and kindreds with which it agrees in habit; it, however, is closely allied to *Dracontium*, both in habit and technical characters, but chiefly differs from that genus in having twice as many stamens as perigonal segments. It therefore constitutes a new genus, which I have great pleasure in dedicating to Mr. George Godwin, F.R.S., F.R.H.S., etc., architect, author of 'Another Blow for Life,' etc., one of the founders of the Art Union of London, and Editor of the 'Builder,' a gentleman who has rendered much willing and substantial aid to literature, science, and art, and who, by his active support of window-gardening in the metropolis, has spread amongst even the humbler classes that taste and love for plants without which, after all, the race of botanists would soon become extinct.

Additional details will be found in the 'Journal of Botany,' Vol. VII. p. 278, where also one of the specimens is described, which Mr. W. Bull, of King's Road, Chelsea (to whom the plant was consigned), exhibited at a meeting of the Royal Horticultural Society at Kensington. This specimen (leaf only) attained within a few inches the dimensions I noted in Nicaragua, and had it not begun to sprout during its passage to England, and suffered at tip from pushing against the lid of the box in which it was planted, there can be no doubt that even this year it would have quite equalled them. Mr. W. W. Saunders having pointed out the interest attaching to the plant, the Royal Horticultural Society recorded its appreciation of it by awarding to this novelty an honorary distinction.

Godwinia, Seem. (gen. nov. Aroidearum). Spatha inferne convoluta, erecta, apicem versus fornicata, aperta, persistens. Spadix perigonanthus, stipitatus, spathæ limbo multo superatus, cylindricus, liber, erectus, densi- ac pluriflorus. *Floriculi* perigonio 6-sepalo, sepalis apicem versus dilatatis, fornicatis, vertice convexulis, in præfloratione irregulariter imbricatis; stamina 12, biseriata, exteriora sepalis alterna, interiora sepalis opposita, filamentis parum compressulis, apice repentino in connectivum tenue acuminatum angustatis, pistillo multo brevioribus, antheræ loculis suboppositis, lineari-ellipticis, apiculo

nullo præditis, connectivum autem superantibus, rimula apicali lateraliter dehiscentibus, extrorsum versis, pistillum elongatum, ovario ovoideo 3-loculari, in stylum longum subrepentino attenuatum, stigmate 3-partito, e centro styli apicis partitionibus spathulato-linearibus angustis protenso-extensum, septis ovarii non ex toto perfectis, loculamentis 1-ovulatis, ovulis e placenta infra medium loculamenti ex axi exsertis, funiculo brevi suffultis, anatropis. *Fructus* ignotus.—Folium solitarium, hysterantium, petiolo longo crasso elato aculeolato maculato, vertice 3-chotomo v. 3-cruri, cruribus in laminam tritomam abeuntibus, partitionibus principalibus pinnatipartitis v. confluenti-pinnatipartitis, costa iterato-dichotomanti. Spatha et spadix saturate violascentes, prior magis in brunneo-rubrum, posterior magis in cæruleum. Species unica :—

1. *B. gigas*, Seem. (sp. nov.), Tab. nostr. n. 95 et 96. Seem. Journ. of Bot. 1869, p. 278.—Mountains of Chontales, Republic of Nicaragua, between the Javali Mine and the Quebrada de los lajas (Seemann !)

Explanation of Plates XCVI. and XCVII. (double Plate).—Fig. 1, leaf (portrait of); 2, spathe drawn to same scale (portrait of); 3, rhizome drawn to same scale as leaf and spathe; 4, part of stem (portion of); 5, portion of segments of leaf, ditto to show venation; 6, base of spadix; 7, diagram of flowers; 8, flower from above; 9 flower, side view; 10, flower with perianth segments reflexed to show ovary; 11, section of ovary; 12, summit of style; 13, stamen, inner side; 14, stamen, outer side; 15, section through anthers; 16, perianth segment from outer side (flattened out); 17, perianth from inner side to show veining (partly flattened out). The corm and flower, from a sketch of Mr. Antonio Fairburn (made in Nicaragua); the leaf from the growing plant in Mr. W. Bull's possession, taken by Mr. W. G. Smith, and the dissection of flower by Dr. H. Trimen, from Nicaraguan specimens preserved in spirit at the British Museum.

NOTES ON ISLE OF WIGHT PLANTS.

By Fred. Stratton, Esq., F.L.S.

Ranunculus Flammula, var. *β. pseudo-reptans*, Syme. Tolerably common. This plant was sent to the London Botanical Exchange Club last year, and is mentioned in the curator's report. The Isle of Wight plant seems to be a late summer or autumn state only of *R. Flammula*, but it is remarkable how entirely in many localities it supplies the place, at a later period of the year, of the parent plant. The flowers are very much smaller, and have generally a star-like appearance, from the petals being narrow and widely separated; bearing, in

this and some other respects, the same proportion to those of *R. Flammula* as the flowers of *Caltha radicans* do to those of *C. palustris* (*fide* Icon. E. B. ed. 3, vol. i.).

Fumaria Borœi, Jord. Brixton, Isle of Wight. In a series of specimens collected by me at this locality, there are some which agree perfectly with the description of *F. Borœi*, Jord., in the third edition of 'English Botany' (vol. i. p. 106), and also with specimens in my herbarium, of that plant, collected by Mr. Boswell Syme at "Auchtertool, Fife, September, 1868." Other specimens from the same locality at Brixton have a very decided resemblance to the authentic specimens of *F. pallidiflora*, Jord., in the British Museum herbarium, and especially to a plant collected by Mr. Borrer in 1848 at Bonchurch, named by him *F. capreolata albiflora*, which Mr. A. G. More has identified as *F. pallidiflora*, Jord. These latter plants from Brixton also agree with the book descriptions, having recurved fruit-pedicels and cream-coloured flowers with dark tips. Probably *F. pallidiflora* and *F. Borœi* are distinct, but the book characters of each are certainly not well marked in any of the plants before me. The character given by Prof. Babington and Mr. Boswell Syme to *F. pallidiflora* of the length of the fruit being rather more than the breadth, is given by Lloyd in his 'Flore de l'Ouest de la France' to *F. Borœi*, and he also appears to have transposed in his descriptions of the fruit-pedicels of the two species the terms "*épais*" and "*rare*." A specimen in my herbarium labelled "*F. pallidiflora*, Jord., hedgebanks, Cuchandall, co. Antrim, Ireland, June 28th, 1866; S. A. Stewart," is clearly *Borœi*.

Crucianella stylosa, De Cand. This plant has established itself in a lane near Carisbrooke Castle, no doubt from some garden, and flowers freely, but I have not noticed any fruit formed. I noticed the plant in 1866, but I have no doubt it existed there long before that time. It is mentioned in 'English Botany,' ed. 3, vol. iv. p. 233, amongst the excluded plants, as having been found by Mr. J. G. Baker on the embankment near Scarborough Railway Station, Yorkshire.

Senecio campestris, De Cand. The only locality given in Dr. Bromfield's 'Flora Vectensis,' is one copied from the 'Hampshire Repository,' vol. i. p. 121, in which it occurs on the authority of the present Dean of Winchester and the Rev. Mr. Poulter, "*Cin. alpina* (*campestris*), Belhan, pl. I. W." Neither Dr. Bromfield nor any one else ever ascertained where this locality was, and the plant was therefore deemed

lost to the island. I am happy to say that in July, 1868, it was found by Mr. J. G. Baker and Dr. Tate on the south-eastern extremity of Westover Down. Dr. Tate kindly took me to the locality on the 5th of July last, when we found the plant abundant and in full bloom; it grows principally on the rough sloping ground, and also more sparingly on the unbroken turf higher up.

Callitriche hamulata, Kutz. Staplers, near Newport. New to the island under this name.

Polygonum aviculare littorale, Link. Totland, Freshwater; in a disused brickfield near the shore.

Echinochloa Crus-galli, Beauv. One fine plant only, observed on the rough ground near the shore at Freshwater Gate. August, 1869. New to the Isle of Wight; (?) and to Hants.

Dr. Tate, F.L.S., has added the following plants to the flora of the Isle of Wight:—

Fumaria micrantha, near Yarmouth.

Diplotaxis tenuifolia, near Cliff End Fort, Freshwater.

Polypogon Monspeliensis, above Yarbridge on Norton side.

Newport, Isle of Wight, October 13th, 1869.

NOTES RESPECTING SOME PLYMOUTH PLANTS.

By T. R. Archer Briggs, Esq.

Hypericum dubium, Leers.—Very rare in the neighbourhood of Plymouth, for within twelve miles of this town I have seen it in only one locality, situated in the vale of the Lynher, between Pillaton Mills and Clapper Bridge, Cornwall. There, in July last, were about a dozen plants, growing mostly either on a bank by the stream that supplies the mill, or on a damp hedgebank, between two marshes.

Hypericum undulatum, Schousb. *H. Bæticum*, Boiss. Lond. Cat. ed. 6.—Several roots in a boggy piece of ground by the road leading from S. Mellion to Pillaton, Cornwall, July, 1869. Copiously in the valley of the Lynher, between Pillaton Mills and Clapper Bridge, growing mostly about springs in a moist pasture, and by the side of a drain parting a wood from a marsh. Further west it becomes more general, and in the parish of Probus, a few miles from Truro, it is one

of the commonest species in marshy valleys, growing with *Pedicularis palustris*, *Myrica*, etc.

Medicago denticulata, Willd.—Many plants on a low cliff at Seaton, near Looe, Cornwall, June, 1869.

Lathyrus Nissolia, L. Plentiful in a piece of ground rendered waste, within a few years, by the Plymouth fortification works, situated between S. Budeaux and Honicknowle, June, 1869. Some plants produced flowers of a flesh colour; others had them of the ordinary crimson tint. This *Lathyrus* seems not so much as naturalized anywhere near Plymouth.

Agrimonia odorata, Mill.—By the road leading to Quethiock village from the St. German's and Callington road, Cornwall; in some quantity, and not confined to one spot, July, 1869. Less plentiful in a lane near Landulph, in the same county.

Pyrus Scandica, Bab.—I now consider this handsome shrub indigenous in the neighbourhood of Plymouth (*vide* Seemann, Journ. Bot., Vol. VI. p. 327). Two large bushes grow in a native wood, principally of oak, between Roborough Down and the river Plym, near Hoo Meavy. One of these had in August last many cymes of unripe fruit, and close by were two young bushes that had sprung from seed; one of them of only two or three years' growth. In a neighbouring wood was another fine bush, with fruit. The allied species, *Pyrus torminalis*, Ehrh., is thinly scattered over S.W. Devon and S.E. Cornwall, in hedgerows and copses.

Epilobium lanceolatum, Seb.—On rubble from the S. Devon slate quarries, between Ugborough and Ivybridge, copiously. May, 1869.

Physospermum Cornubiense, De Cand.—The fact that this species grows plentifully in the neighbourhood of Bodmin, Cornwall, has been long known to British botanists; but probably few are aware that another portion of this county also produces it in great abundance. I did not know that such was the case until I met with the following statement, from an anonymous writer in the 'Journal of the Royal Institution of Cornwall,' April, 1868:—"Some of our rarest plants are fortunately so abundant in the localities in which they are found, that there is not the slightest possibility of their extermination. This is the case with the *Physospermum*, which abounds in every bushy field in a direct line between Halton Quay, on the banks of the Tamar, and Newton Ferrers, on the river Lynher. My attention was first drawn

to this plant by Mr. Kempthorne, of Callington, who found it growing in a field near Newton Ferrers. On grassy knolls among the heath and furze of Vernico, the *Physospermum* is particularly plentiful." I have, to some extent, verified the above statement during the past summer, for, within the tract of country indicated, I have found it in abundance in woods by a tributary of the Lynher, near Pillaton, and also quite common in many spots near Clapper Bridge. It has, moreover, a wider range than the writer above quoted gives it, for it is plentiful in spots on and about Hammet and Hayfield Downs, between Newton Ferrers and Quethiock.

Galium verum, L.; *β. ochroleucum*, Syme, Eng. Bot. ed. 3; Lond. Cat. ed. 6.—A patch of this occurs on a cliff near Lugger's Cave, above Whitsand Bay, Rame, Cornwall. Plants of both *Galium verum*, *a. luteum*, Syme, and *Galium Mollugo*, L., grow near it.

Valerianella Auricula, De Cand.—In a cornfield between Quethiock and Hammel Down, Cornwall; growing with *V. dentata*, Koch. July, 1869.

Lysimachia vulgaris, L.—Near Plymouth I have seen this species only in the valley of the Lynher, and there but sparingly. It occurs, however, many miles further west, near Probus, Cornwall, where I gathered it recently.

Centunculus minimus, L.—From its small size this is often overlooked, and so is probably a commoner species than many suppose. During last July and August I found it at the six following localities, all within twelve miles of Plymouth, but at none of which, so far as I am aware, had any one noticed it before. In a damp spot, on Crownhill Down, near Newnham Park, growing plentifully with *Radiola Millegrana*, Sw., a species it is very commonly associated with; in two or three spots (abundant in one) in a bushy meadow between Bickleigh and Roborough Down; in two others in the vale of the Plym, between Meavy and Hoo Meavy; these localities are in Devon. On Viverdon and Pillaton Downs, and in a vale by a tributary of the Lynher, over which passes the road from S. Mellion to Pillaton village, Cornwall. At the last station it was in August last plentiful by the cart-track in the vale, a few gunshots above the bridge.

Littorella lacustris, L.—In and about two ponds near the "China Clay Works," on Crownhill Down, near Plympton. In the neighbourhood of Plymouth the *Littorella* is a very rare plant.

Chenopodium Bonus-Henricus, L.—Four plants in a waste spot close to Newton Ferrers House, an old mansion, formerly the seat of the Corytons (now of Pentillie), near Pillaton, Cornwall, August, 1869. Within twelve miles of Plymouth I have met with it in only one other spot, near another Newton Ferrers, which is in Devon. There, too, it occurs close to an old mansion, Puslinch House. It is most clearly a denizen at both places, through its having been formerly cultivated as a potherb.

Habenaria bifolia, "Br.;" Bab.—Many specimens on Ringmoor Down, near Sheepstor, Devon. June, 1869. Pillaton Down, Cornwall. 1869.

Narcissus biflorus, Curt.—Some patches of this on top of a hedge-bank, bounding an orchard, at Kingsmill, near Landulph, Cornwall, and also in the orchard. April, 1869. Sparingly with the double-flowered variety of *Narcissus poeticus*, L., in an orchard near Boringdon House, Weston Peverell, in the spring of the same year. Some botanists seem to consider *N. biflorus* a native in the West of England, but at all the spots where I have hitherto seen it in Devon and Cornwall, it is clearly nothing more than a denizen. In an orchard, at Bickleigh, the double-flowered *N. poeticus* is as abundant as I have ever seen *N. biflorus* in any one locality.

Botrychium Lunaria, Sw.—Rare, near Plymouth. It, however, occurred very plentifully in a grassy pasture, rather more than 800 feet above the sea-level, a few miles from Plympton, in June, 1869. The same locality produced *Ophioglossum vulgatum*, L., but not so abundantly as it did the *Botrychium*.

The places mentioned above are in Devon, unless the contrary is stated.

4, *Portland Villas, Plymouth, October* 6, 1869.

NOTES ON SOME PLANTS OF OTAGO, NEW ZEALAND.

By W. Lauder Lindsay, M.D., F.R.S.E., F.L.S.

Genus I. Epilobium.

With Dr. Hooker, I feel at a loss whether to regard some at least of the Otago *Epilobia* as *species*, or as mere *forms* of a comprehensive Protean type. It is only the non-possession of a sufficiently complete

or extensive suite of specimens—which might illustrate fully the *variations* of individuals—that prevents my adopting that view which regards the plants in question, as *forms* rather than *species.** Between several of the plants separately named in Dr. Hooker's 'Handbook of the New Zealand Flora,' there are not, so far as I have observed, any good or permanent differential characters of *specific* value. And I cannot doubt that a study of any considerable suite of individuals *in their living state* will lead to a *reduction of the present number of book-species!* There is a general physiognomical resemblance between the Otago and British *Epilobia;* and one at least of the former, *E. tetragonum*, L., *is* British.

In cultivation in this country, some of the Otago *Epilobia* appear to be *hardy.* Mr. Gorrie informs me that several small woody species, which were contained in soil and Tree-fern-stems sent him some years ago from Otago, have successfully stood out several winters in northern exposures at Trinity, near Edinburgh.

1. *E. junceum*, Forst. Uplands, about Fairfield, Saddlehill, 12–15 in. high; Chain Hill ranges, 8–10 in.; ranges about Finegand, Lower Clutha; December, in flower, W. L. L. Apparently one of the commonest Otago species. Some of its states resemble, in general aspect, our *E. palustre*, L., and *E. parviflorum*, Schreb. Its leaves are occasionally infested by the parasitic *Æcidium Otagense*, Linds.†

The Saddlehill plant is certainly *not* very pubescent or tomentose. The young flower and leaf-shoots only are covered with a very fine white tomentum. There is a very slight puberulence observable here and there on the stem; while the mature leaves are glabrous on both surfaces, or they have occasional traces only of puberulence. Branches about 1 ft. high. Lower leaves linear-oblong or oblong-lanceolate, about 1¼ in. long and under ¼ in. broad; distantly alternate; margin variously sinuate-serrate. Upper leaves entire, smaller, and more linear.

The Finegand plant is shorter, more procumbent, and more leafy. There is less tomentosity of young leaf and flower-shoots, and of calyx-tube. Puberulence exists on young leaves only. Leaves smaller, nar-

* I am disposed to agree with Dr. Müller, who, in his 'Vegetation of the Chatham Islands,' makes only *one species* of *Epilobium* and *Veronica !*

† "Observations on Otago Lichens and Fungi," Trans. Royal Society of Edinburgh, vol. xxiv. p. 431, plate xxx. figs. 69, 70.

rower, generally only $\frac{1}{8}$ in. broad, sometimes as long as in the Saddlehill forms (which are $1\frac{1}{4}$ in.); sinuate; toothing seldom very sharply marked; few leaves (and only young ones) entire or nearly so.

2. *E. pubens*, A. Rich. Among "scrub" on roadsides, Caversham, Dunedin, 20–25 in. high; December, in flower, W. L. L. Stem much branched. All parts of plant puberulent. Puberulence best marked on the young branchlets and leaves, and on the midribs, veins, and margins of the mature leaves; least distinct on the lower woody parts of the stem, which are sometimes almost glabrous. Central leaves much the largest, about $1\frac{1}{4}$ in. long, and $\frac{1}{2}$ in. broad, but variable in size; upper and lower ones smaller. Margin generally irregularly sinuate-serrate; sometimes entire, or entire only in lower half or third. Leaf-petioles seldom exceed $\frac{1}{4}$ in. long; sometimes they are $\frac{1}{2}$ in. Flower small, about $1\frac{1}{4}$ in. in diameter, whitish.

In specimens from Tarndale, Nelson, in my herbarium (collected by Dr. Sinclair), the plant is shorter and less ramose. There is less puberulence of all its parts; less serrature of leaf; shorter capsules. Leaves occasionally opposite, and broader in proportion to their length than in the Caversham plant.

3. *E. macropus*, Hook. Ranges about Finegand, Lower Clutha; December, in flower, W. L. L. Branches generally 5–6 in. high, deep red; puberulent throughout, the puberulence best marked, as usual (where it exists), on the younger branchlets. Leaves membranous, ovate, and uniform in size; seldom exceed $\frac{1}{2}$ in. long, and $\frac{1}{3}$ in. broad. Upper and lower smaller than intermediate ones. Margin irregularly and very slightly notched, or almost entire; sometimes entire, especially in lower leaves. Leaf-petioles very short, so that young, and especially upper, leaves appear subsessile. Flower peduncle neither slender nor long (generally under $\frac{1}{2}$ in. in length).

In Tarndale specimens in my herbarium, the plant scarcely differs from the Otago form. There is, however, less puberulence of branches and a longer flower-peduncle (here sometimes $\frac{1}{2}$ in. long).

4. *E. alsinoides*, A. Cunn. Uplands about Stoneyhill; December, in flower, W. L. L. Subprocumbent. Branches flexuose, leafy, generally under 6–8 in. long; puberulent (puberulence being best marked in young branchlets, on their tips). Leaves broadly ovate, entire; a few upper ones with the indistinct, sinuate toothing of those of *junceum*, *pubens*, and *macropus*; glabrous on both surfaces; largest about $\frac{1}{3}$ in. long and $\frac{1}{3}$ in. broad. Calyx and capsule white-tomentose.

5. *E. rotundifolium*, Forst. Banks of the stream, Abbott's creek, Greenisland, 5 6 in. high; November, in flower, W. L. L. Stems under 6 in. high, puberulent, but puberulence only well-marked superiorly (on young shoots). Leaves glabrous on both surfaces, sometimes with traces of puberulence. Central leaves (about centre of stem), as usual in the Otago *Epilobia*, larger than upper and lower ones. Longest leaves about ½ in. long, and somewhat less in breadth. Outline of leaf sometimes suborbicular. Margin sinuate-serrate; teeth sharper than in the other Otago species above mentioned; but unequally or irregularly so, as is also usual in the New Zealand *Epilobia*. Leaves opposite, so shortly petioled as to become sometimes, in the upper and lower parts of the plant, subsessile. I have never seen the leaves uniform in size and form throughout the plant. Flower whitish.

Though I did not myself meet with others, I believe there are few of the 17 New Zealand species of *Epilobium* that do not occur in Otago.

Genus II. Hypericum.

There are only two New Zealand species, both of which occur in Otago. These species are connected by *passage-forms*, and the remarks which I have had occasion elsewhere* to make regarding the problem of *unity or plurality of species* in certain *genera* of Otago plants are very applicable here. I am disposed to consider *H. Japonicum* as merely a dwarf, straggling, procumbent, slender condition of *H. gramineum*.

1. *H. gramineum*, Forst. Chain Hill ranges, common; Uplands around Stoneyhill; December, in flower, W. L. L. Generally 6–8 in. high, growing in tufts. Resembles in general aspect the British *H. linariifolium*, Vahl. My specimens have as great a tendency to procumbency as *Japonicum*. Branches about 6 in. high: 4-angled character not always distinct. Leaf oblong-lanceolate, with revolute margin; generally under ½ in. long, and ⅛–¼ in. broad. Frequently acquires in drying various shades of buff or brown. Flowers 2 or 3; peduncles subdivided (branching secondarily) or simple. Sepals in herbarium assume the orange-red tint of the corolla.

2. *H. Japonicum*, Thunb. Ranges about Finegand, Lower Clutha, abundant; December, in flower, W. L. L. Generally 3–4 in. high,

* 'Contributions to New Zealand Botany' (1868), p. 102: illustrations in the genera *Aciphylla*, *Geranium*, *Gualtheria*, *Wahlenbergia*, *Veronica*, *Sophora*, *Phormium*, *Coriaria*.

with a comparatively large, conspicuous, orange flower; has somewhat the aspect of the British *H. humifusum*, L. Branches 2½–3 in. high. Lower leaves oblong-ovate; upper ones lanceolate-oblong, as in *gramineum*. Leaf generally broader and more spreading from the branch than in *gramineum:* revolution of its margin not so common, though the tendency exists. Flowers in twos; peduncles simple, very short or inconspicuous amid the terminal leaves. The plant is smaller in most of its parts than—without, however, any proper distinction from —*gramineum*, to which I do not hesitate to refer it. Not even as a specially named variety would I separate it, regarding it as I do as a mere small *form* or condition of *gramineum*. It is by the separation and naming of such forms or conditions that classification becomes burdened with an unnecessary and mischievous number of *pseudo-species!*

Genus III. Parsonsia.

Its species are "Supplejacks" or "Lawyers"—climbers on forest trees; and, especially when in flower, among the most handsome ornaments of the New Zealand "Bush." The genus resembles *Rubus* in the variability of leaf even on the same plant. According to my specimens *P. albiflora* and *P. rosea* are very different plants (as to leaf and whole habit). *P. rosea* is not, however, in flower, so that I cannot properly compare them. I believe they will be found, like so many other New Zealand species, to be connected by passage-forms.

1. *P. albiflora*, Raoul, (*P. heterophylla*, Fl. N. Z.,) East Taeri bush; November, young, W. L. L. The "Kaiku" (or "Kai-ku") of the North Island Maori (Colenso). Buchanan recommends it for cultivation in this country as a covering (a creeper) for bowers, after the manner of Jasmine. In flower, smell, and habit, it somewhat resembles the common garden Jasmine, whose representative it may be held to be in New Zealand. Its fine, large, terminal panicle of white flowers renders it one of the handsomest "Supplejacks" of Otago. In drying for the herbarium, all its leaves assume a brown or blackish-brown colour, blackest on the upper shining surface; the under side having a duller leathery aspect. The foliage then resembles that of some species of *Metrosideros* when dried, *e.g. M. lucida*. Corolla dries to a brownish-yellow; lobes about as long as the tube.

My plant is a stout woody shrub, resembling in its branches and foliage *Metrosideros lucida*. Puberulence of stem, branches, and midrib

of leaf (under surface) very slight and with difficulty distinguishable, unless under the lens; best noticed on the young flower-panicles (flower-pedicels and calyx). Leaf generally 2 in. long and ¾ in. broad, more or less broadly ovate, sometimes lanceolate or broadly obovate or obcordate, usually acuminate or mucronate, sometimes retuse. Margin more or less entire, but some leaves have a very irregular sinuate outline: or they exhibit irregular notches, which are a tendency to the greater sinuosity of outline that characterizes the leaves of *rosea*. Midrib distinct on both surfaces, especially lower. Transverse veins indistinct on either side and especially on upper surface.

2. *P. rosea*, Raoul (*P. capsularis*, Fl. N. Z.). East Taeri bush, climbing on *Rubus australis;* Christie's Bush, Saddlehill; November, in flower, W. L. L. In the climbing form on *Rubus australis*, the stem is slender, twining, finely puberulent, the hairs being yellowish and very fine, as in *albiflora*. Leaves linear or linear-lanceolate, but as coriaceous as in *albiflora*, 2–2½ in. long and ¼ in. broad, broadest at the roundish turgid base, tapering gradually to a point. Margin irregularly sinuate. Upper leaves nearly entire, lanceolate; all leaves very shortly petioled.

In the more shrubby form of the plant there is much branching; the branches spreading irregularly, and variously twisting and doubling on themselves. Stem and main branches glabrous; ultimate ramuscles (especially young shoots) puberulent as in *albiflora*. Leaves vary greatly in a single specimen, much larger and narrower than in the climbing forms 3½–4 in. long sometimes, and ⅛ in. broad, always broader at base and tapering to a point. Margin irregularly sinuate or notched: or sinuosity or notching is so inconspicuous that the leaf is almost entire; all these variations of margin occurring sometimes on the same branch. Margin also frequently revolute. Leaves as coriaceous as in *albiflora*, drying to the same colour; sometimes twist on themselves like the branchlets.

Genus IV. Pimelea.

This is one of many Otago genera (*e.g. Coprosma*, *Gualtheria*, *Coriaria*, *Panax*, *Wahlenbergia*, etc.) the book-descriptions of whose species I find it impossible with my limited series of specimens satisfactorily to follow. I have a strong conviction that certain presently considered *species* are possibly mere *forms*, and that a careful revision of such genera, with the aid of large suites of specimens, especially *in*

the living state by local botanists, ought to lead to a great *reduction of the present number of book-species!*

1. *P. prostrata*, Vahl. Sand-dunes about mouth of Kaikorai Stream; Kaikorai Hill; Signal Hill, North-east Valley, Dunedin; November and December, in flower, W. L. L. Dr. Hooker named my Otago plant *P. Urvilleana;* but, in his 'Handbook' (p. 244), he describes the latter as a *North* Island species only, and evidently refers such plants as mine to *P. prostrata.* Without a fuller suite of specimens before me, it is impossible to give a final opinion; but from comparing Dr. Hooker's descriptions of *P. Urvilleana* and *P. prostrata* with each other and with my plants, I find myself unable to recognize any valid *specific* distinction between them. In some of my plants the villosity of the young and ultimate ramuscles is marked; and the distinction between whiteness and greyness of the hairs is not one that is very evident or satisfactory. In all my specimens the leaves are similar, of comparatively uniform character, about $\frac{1}{6}$ in. long, mostly ovate or ovate-oblong, subacute or obtuse at tip, crowded more or less, and frequently imbricate. Branches sometimes 16–20 in. long. Some forms of the shrub are erect or suberect; the same form occurring on the sea-level (sand-dunes) and on the hill-ranges (*e.g.* Kaikorai, 1092 feet). Flower-tube as villous as the ultimate ramuscles, and with the same white, long, silky hairs. Perianth-lobes shorter than the tube.

Of ten New Zealand species of *Pimelea*, at least five others (apparently) occur in Otago, some of them ascending to elevations of 5500 ft. (on the Canterbury Alps, *P. Lyallii*, Hook. f.), viz. *P. Gnidia*, Forst.; *P. Traversii*, Hook. f.; *P. virgata*, Vahl; *P. sericeo-villosa*, Hook. f.

Genus V. CONVOLVULUS (*Calystegia*, Fl. N. Z.).

Another of the numerous Otago genera that require revision by *local botanists*, with a view to the clearer definition, on the one hand, or the fusion on the other, of its present *book-species. C. Tuguriorum*, *C. Soldanella*, *C. sepium*, and *C. erubescens*—with the British *C. arvensis*, L.—appear to me to pass into each other by imperceptible gradations; and I do not see where or how the *specific demarcation-lines or definitions* can be properly drawn!

1. *C. Tuguriorum*, Br. Among "scrub," and in the forest, Stoney-hill bush; December, in flower, W. L. L. A climber, with the habit, in certain respects, of *C. sepium*, and in others of *C. arvensis.* The

latter, however, has a different form of leaf. Between *Tuguriorum* and *sepium* there are sometimes considerable differences, as regards the size of the plant, size and form of leaf, form of bracts, and other characters, especially if the contrast be made with the larger forms of the latter species. Nevertheless they do not seem to me to be properly separable. In my specimens of *Tuguriorum*, stem and leaves are glabrous. Leaf about 1 in. long, acuminate, 2-lobed at the base, broadly cordate. Bracts as long as the calyx, broadly ovate, acuminate.

2. *C. Soldanella*, Br. Sand-dunes about the mouth of the Kaikorai; October, young, W. L. L. The "Pānahi"* or "Nāhināhi" of the North Island Maori,—terms, however, probably applied also to other species of the genus.

Roots several feet long, trailing over or in the sand, like those of various of our littoral "Bents" (grasses or sedges). Leaves glabrous, cordate-reniform, not decidedly broader than long, about 1 in. both in length and breadth, subacuminate, less reniform and with a much more acute apex than in any British specimens, in some respects intermediate in character between those of *Tuguriorum* and *sepium*, but stouter than either.

Though I did not myself meet with them, *C. sepium*, L., and *C. erubescens*, Br. also apparently occur in Otago. The former is "Pānahi" and "Pohūehūe" or "Pohue" (Colenso) of the North Island Maoris, who also probably apply the term "Wēne" to its young shoots (Williams), its rhizome, like that of *Pteris aquilina*, var. *esculenta*,† having once formed one of the native *foods*. Certain forms of *C. sepium* closely approach those of *C. Tuguriorum*; they appear, moreover, to affect the same habitat, and to occur occasionally intermixed, whence it happens that they are apt to be confounded,—if they are to be considered separate species, an arrangement of the propriety of which (I have already stated) I have some doubt. In Holstein specimens of *C. sepium*‡ (from Wedel, on the Elbe), the leaves are very delicate and membranous, 4 in. long by 3 in. broad.

Genus VI. SOLANUM.

1. *S. aviculare*, Forst. In the bush, Jeffcott's station, Stoneyhill,

* *E. g.* "Panachi," applied also to *C. sepium* (Colenso).

† *Vide* my paper on "Otago Ferns," Trans. of Botanical Society of Edinburgh, vol. ix. p. 40.

‡ "Notes on the Flora of Holstein;" 'Phytologist,' new series, vol. i. p. 369.

and Christie's station, Saddlehill, abundant; November, in flower, December, in fruit, W. L. L. The "Kohōho" or "Kohokoho"—the "Pōropōro,"* "Poropora," or "Poporo"—of the North Island Maori (Colenso).

A large, very handsome shrub, resembling, on the large scale, our *S. Dulcamara*, L., with large, orange-coloured, edible berries, the size of a cherry. Leaves very variable as to form and size, on different parts of even the same plant; simple or entire and lanceolate, and then generally shorter than those which are divided, though sometimes 9 in. long; or variously hastate or palmate, or irregularly notched or divided (subpinnatifid). In out-door summer cultivation in Britain, the plant is said to grow very rapidly, and to be of robust habit. It attains a height of 5–6 ft. in one season. The leaves are described as becoming large and of a beautiful dark green, rendering it a handsome showy acquisition to British gardens. It is propagated with ease both from cuttings and seed. It requires a rich deep soil, and copious waterings in summer, and to be kept nearly dry and in a temperate house in winter.†

I did not meet with *S. nigrum*, L., which is represented as being extremely common in the *North* Island. It is probably to it that the Maoris apply the terms "Peōi" and "Raupete," though one or both may also pertain in part to *S. aviculare.*

Genus VII. Myosotis.

1. *M. antarctica*, Hook. f. (*M. australis*, Fl. N. Z.). Uplands about the base of Stoneyhill and Saddlehill, 6 in. high; hills above the Forbury Heads, Dunedin, a dwarf form, in spreading tufts not above 2 in. across when laid quite flat; December, in flower, W. L. L. Tarndale and Dun Mountain, Nelson, in Herb. Dr. Sinclair at Auckland, and in my own herbarium. My specimens from elevations of about 500 ft. in Otago, do not differ much from those collected at a height of 4000–5000 ft. in the Tarndale district by Dr. Sinclair. In both cases, the dense clothing of white hairs gives the plant quite an *alpine* physiognomy. In certain respects, it represents and resembles the common British *M. arvensis*, Hoffm., and *M. collina*, Hoffm.

2. *M. capitata*, Hook. f. On the Trap cliffs, Shaw's Bay, mouth of the Clutha; December, W. L. L. Specimens from the Dun Moun-

* In common with *S. nigrum*, according to Colenso.

† Kelly, "Report on the Subtropical Garden of Battersea Park," 1865.

tain, Nelson, in Dr. Sinclair's herbarium, much resemble in the beauty of the large flower and in general aspect our *M. alpestris* Schmidt, whose representative in New Zealand it is in some measure.

Of a total of 9 New Zealand species of *Myosotis*, at least 7 occur in Otago. Some of them are subalpine or alpine, ascending to 6000 ft. (e. g. *M. Hectori*, Hook. f.).

Genus VIII. TYPHA.

1. *T. angustifolia*, L. East Taeri swamps; Finegand lagoon, Lower Clutha, W. L. L. North Taeri swamps (Martin); swamps on banks of the Clutha (Buchanan); swamps of the Matukituki, Wanaka Lake (Sullivan).

Dr. Hooker, both in the Flora N. Z. and the Handbook (p. 276), restricts its distribution to the *North* Island. But here he is certainly in error, inasmuch as the plant is more or less abundant in the swampy grounds of the low lands *throughout the South Island also.**

To the settler the plant is well known as the "Raupo" or "Bulrush;" and the swamps in which it is plentiful—sometimes to the exclusion, for the most part, of other phænogamic vegetation—are known as "Raupo swamps" ("Waraūpo" of Dieffenbach), just as "Flax swamps" or "Tussock swamps" are spoken of. So familiar, indeed, are the plant and its economical applications to the natives, that not only as a whole, but special of its parts or products have one or more Maori designations. Thus the plant as a whole is their "Kārito," "Kōpupūngawha," "Kopu-pungawa" (or its contraction "Ngawha"), or "Koware." The root, which is eaten both raw and cooked by the natives,† is "Koreirei" or "Kouka."‡ The down of the seeds is "Hune" ("Iahune" of the East Cape and "Tahunga" of the Ngapuhi dialects; and a sort of cake or bread made of the flower-pollen, as well as the pollen itself, are the "Pūngapūnga" (East Cape dialect).

Prior to, and in the earlier days of, the colonization of New Zealand, the huts (or "Wharés") both of settlers and natives were, frequently at least, lined and thatched, if not sometimes also built, of "Raupo" stems; but few of these huts or of the "Wharés" built, lined, or

* The *Middle* Island of Dr. Hooker's 'Flora N. Z.' and 'Handbook.' *Vide* my 'Contributions to New Zealand Botany,' p. 7.

† Thomson's 'New Zealand,' vol. i. p. 157.

‡ A term also applied to *Cordyline indivisa*. While with "Koreirei" may be compared the word "Korari," which pertains to a much more familiar indigenous plant, *Phormium tenax*.

roofed with Tree-fern stems and leaves, or with "Totara" bark, wood, or shingle, are now to be seen in the vicinity of European settlements. "Raupo" is sometimes associated with "Maori Heads"* (*Carex virgata*, var. *secta*), as one of the landmarks of the dangerous swamps of the interior, which have been described by Sullivan and other explorers (*e. g.* in the Matukituki district, about Lake Wanaka).

Genus IX. LIBERTIA.

1. *L. grandiflora*, Sweet. (*L. ixioides*, var. *macrocarpa*, Fl. N. Z.). Church Hill, Dunedin; Greenisland coast-cliffs; sand-dunes about mouth of the Kaikorai; ranges between Kaikorai Hill and the Taeri Plains; November, in flower, W. L. L. In its panicle and flower-stem the plant somewhat resembles our *Alisma Plantago*, L., a genus, and belonging to an Order, not represented in New Zealand. The capsule, stem, and leaves are the seat of a very minute, black, punctiform, parasitic *Sphæria*. Flower-stem is 10–15 in. long. Leaf sometimes 3 ft. long, and $\frac{1}{3}$–$\frac{1}{2}$ in. broad; linear and grass-like, but rigid and coriaceous. I suspect *L. grandiflora* is properly but a form of *L. ixioides*—which is the "Turutu" of the South Island Maori (Lyall), a term also applied to *Dianella intermedia*, Endl. (N. O. *Liliaceæ*)—having larger flower and fruit. The size of the latter is, however, an inconstant character, and an unsafe basis, therefore, *per se*, for classification.

What appears to be my Otago plant (white-flowered) has stood well, in open ground, several winters (1865–66–67) at Trinity, near Edinburgh; as yet, however, flowering sparingly (Gorrie and Anderson-Henry).

Genus X. DROSERA.

1. *D. binata*, Lab. Swamps, Abbott's Creek, Chain Hills; December, in flower, W. L. L. Leaf-petioles 2 in. long, or under. Leaf-lobes simple, with a tendency to fibrillose division at tips, $1\frac{1}{4}$ in. long, and $\frac{1}{16}$ in. broad. Glandular hairs of leaf mostly fringe its margins; they are filiform and very long, sometimes $\frac{1}{8}$ in. in length. Scape 5 in. high. Cyme 5–6-flowered. Sepals glabrous. All parts of flower dry to a deep black.

Genus XI. SALICORNIA.

1. *S. Indica*, Willd. Sand-dunes on the Greenisland coast; No-

* *Vide* author's Paper on "Otago Glumaceæ," Trans. Botanical Society of Edinb., vol. ix. p. 74.

vember, young, W. L. L. Resembles and represents our *S. herbacea*, L. than which it is a somewhat larger plant. Joints about ⅓ in. long, under ⅛ in. broad; seldom 2-lobed at tip.

Genus XII. ACÆNA.*

Buchanan reports † a new species as occurring on the banks of the

* *Vide* also 'Contributions to New Zealand Botany,' p. 57.

† "Sketch of the Botany of Otago" [appended to the Survey-Report of the South-Eastern districts, by the late Alexander Garvie, C.E., District Surveyor], by J. Buchanan, of the North-East Valley, Dunedin; late of the Government Survey Department, and subsequently Botanist attached to the Geological Survey under Dr. Hector.

This 'Sketch' or 'Report' was in MSS., was not published, though an official, and so far a public document; and perhaps was not drawn up for publication. I had an opportunity of perusing it, while in Otago in 1861, by favour of the officials of the Provincial Government Survey. It testified abundantly to its author's botanical acquirements, enthusiasm, and industry, and to the ingenuity of his views on the relations of plants to the soil on which they grow in Otago. But he appears to have accompanied the Survey simply as an amateur, with a view more to the acquisition of a general knowledge of the physiognomy of the Otago flora than to making specific collections or contributions to the said flora. He was apparently unprovided with proper apparatus and opportunities for the preservation, or even the collection, of plants. He tells us he was able only to pick up a few plants now and then in the hurry of his "march." Few of them were examined while fresh; he aimed in his 'Sketch' at giving only the *generic* names, and frequently not even them. He had evidently no facilities for reference to herbaria or publications that might have assisted him in the determination of *species*. Hence he has committed, in his said unpublished report, errors of a kind that could scarcely, under the circumstances, have been avoided; errors, however, which, though quite permissible and pardonable, under these circumstances, prevent our attributing a full value to, or bestowing unhesitating confidence in, his observations as therein recorded. It is but fair to the reputation of an excellent Naturalist, who has since done good service to the Botany of New Zealand, and whose good services have been commemorated by Dr. Hooker, by the attaching his name to not a few new species of plants, to explain that, so far as I am aware, his essay was the first that had been written on the *Botany of the districts referred to*; that it was not published; and that under the whole circumstances of its production it is not fairly open to ordinary scientific criticism as a botanical "guide" or "Florula."

The kind of errors into which Buchanan has fallen in the "Sketch" above alluded to, may be illustrated by the following citations:—He mentions a *Jacksonia* (N. O. *Leguminosæ*); an *Orchis*; species of *Aster*, *Chrysanthemum*, *Hieracium*, *Leontodon*, *Sedum*, etc. as occurring in Otago; whereas the 'Handbook of the Flora of New Zealand' records *none* of these *genera* as being represented at all in New Zealand! He also speaks of *Laurels* (N. O. *Laurineæ*) as growing in the bush on the Clutha Islets, and in other parts of the South-Eastern districts. According to the 'Handbook,' however (p. 238), the only representatives of the Order in New Zealand are the genera *Tetranthera*, *Nesodaphne*, and *Cassytha*, which are exclusively *North* Island trees!

Similar errors have been necessarily committed under similar circumstances by other local botanists. Thus Martin describes *Knightia excelsa*, Br. (N. O. *Proteaceæ*), the "Honeysuckle-tree" of Wellington—the "Rewa-rewa" of the

Clutha, in the interior of the province; probably what Dr. Hooker subsequently called in honour of that active local botanist *A. Buchanani*, though it may be *A. adscendens*, Vahl, or *A. microphylla*, Hook. f., both of which also occur in the central lake districts of Otago.

DESCRIPTION OF TWO NEW SPECIES OF *VITIS* FROM CENTRAL AMERICA.

By Berthold Seemann, Ph.D., F.L.S.

Vitis (Cissus) Chontalensis, sp. n., Seem. mss.; glabra, ramulis angulatis; foliis 3-foliolatis, foliolis lateralibus oblique ovato-acuminatis, terminali elliptico, omnibus dentatis; cymis compositis, cymulis 10–12-floris, pedicellis calycibus corollisque coccineis, petalis 4 triangulari-ovatis acuminatis (deciduis); staminibus 4, antheris ovatis (filamentisque flavis); ovario ovato-acuminato (viridi), stylo elongato (coccineo), stigmate punctiformi.

This elegant climber is very abundant in the wooded mountains of Chontales, Republic of Nicaragua, Central America, where it covers rocks and trees, and by its graceful habit, lovely green foliage, and bright scarlet flowers (which appear about Christmas), forms a conspicuous object of the scenery of that region. It was introduced by me, together with two other species of *Vitis*, and handed over to Mr. William Bull, of King's Road, Chelsea.

Vitis (Cissus) Javalensis, n. sp., Seem. mss.; ramulis teretibus striatis petiolisque glabris; foliis simplicibus cordatis acuminatis mucronato-dentatis, supra pulchre pubescente-velutinis viridibus, costa venisque purpurascentibus, subtus glabris purpurascentibus; cymis compositis (coccineis).

This is another apparently undescribed *Vitis* from the Chontales mountains, where it grows about the Javali gold and silver Mine, but it is not so abundant as *V. Chontalensis*, nor does it flower so freely. The flowers, however, are of as bright or even brighter scarlet than

Maoris—as occurring in Otago, where its wood is said to be commonly used for fencing. The flower, he says, is like that of our Honeysuckle. But, according to the 'Handbook' (p. 241), this is exclusively a *North* Island tree. If so, Martin is in error as to the *genus* and *species*. It does not however follow that the 'Handbook' is right and he wrong; for I have shown in the present paper at least one conspicuous instance of error—in citing a common New Zealand plant, the *Typha angustifolia*, as exclusively restricted in its distribution to the *North* Island! (*Vide* also *Pimelea prostrata*.)

those of *V. Chontalensis*, whilst the leaves are much more handsome, rendering it a highly ornamental plant. This species is also in Mr. Bull's possession.

ON VERNACULAR NAMES.

Mr. James Collins, in his "Notes on some new or little-known Vegetable Products" ('Pharmaceutical Journal,' August, 1869), in speaking of the East Indian "Nag-kassar," and after stating that the name is spelt in various ways, and applied to several distinct plants, says,—

"This is a good illustration of the value to be set on native names. Though Dr. Seemann, who has paid great attention to vernacular nomenclature, observes justly,* 'that the medical man, the chemist, or traveller, by simply asking the native name, would instantly have the scientific appellation, and that they are less fallible than generally supposed,'—yet it is not sufficient to find in any book, however high an authority it may be, the native name appended to a scientific one, to identify them; it is only a means to an end, not the *end* of inquiry itself. Native names are exceedingly valuable, but are frequently misapplied by traders and others, and they point out generic affinities rather than specific distinctions."

Now, I am sorry that I cannot agree with Mr. Collins that "Nag-kassar" is a good illustration of the value to be set on native names; on the contrary, I hold that it is a very bad one. It seems to be a general term for the *products* of certain plants yielding a yellowish dye;† and it would be just as reasonable to say that our collective term "Corn" is a proof of the slight value to be attached to vernacular names of plants, because it embraces the *products* of cereals belonging to widely separated genera. It is certainly *not* a characteristic of genuine native names that they have a collective meaning, or, as Mr. Collins puts it, "point out generic affinities rather than specific distinctions." On the contrary, any one who will take the trouble to examine lists of names used by unscientific peoples or

* 'Popular Nomenclature of the American Flora.' Hanover. 1851. (Preface.)

† Sauerwein, in 'Bonplandia.' 1856, p. 300. Article "Nag-kassar."

nations, will find proper names for almost every plant, and an almost, or even an entire absence of such generic or collective names as would be welcomed by the botanist,—and for this simple reason, that such generic terms can only spring up amongst people after they have commenced to generalize, and must not be sought for where philosophical thought has not yet penetrated. This I maintain, with a collection of no less than 30,000 vernacular names by my side,—all alphabetically arranged.

Mr. Collins, in quoting certain parts of the preface of my 'Nomenclature of the American Flora,' paraphrases them in such a way (though putting them between marks of quotation) that I am made to say very different things to what I actually did say. I never hinted that a vernacular name could possibly be "the end of inquiry itself." I stated merely: "A well-arranged synopsis of the vernacular with the corresponding scientific names would *prove highly useful*. . . . The medical man, the chemist, the traveller [the merchant], in fine, any one coming in contact with the vegetable kingdom, would be equally benefited. By simply asking the native name, they would instantly have the scientific appellation, *the key to further inquiries*. Occasional mistakes may indeed occur, but these are the exception, not the rule."

I regret, with Mr. Collins, that vernacular names are frequently misapplied by traders and others, though, in proportion, probably not more so than scientific ones. Much that is at present unsatisfactory about them would be set aside if we had a code of laws for them as we now have, thanks to the illustrious Alph. de Candolle, for our scientific nomenclature. But until then there will be much misconception and slovenly work. To travel no further, we have as yet not even a complete collection of the popular names of the British Flora, the so-called English book-names being often quite worthless renderings of scientific names, not such as are used by the people; and Mr. Britten and friend* will do good service if they collect them from the lips of the people.

* The two have issued the following advertisement:—

"LOCAL NAMES.—It is desired to collect as many as possible of the local names of British plants; and the assistance is requested of all who take an interest in the subject, or who may have the opportunity of ascertaining and recording them. Any lists sent to Mr. James Britten, Royal Herbarium, Kew, W., or to Mr. Robert Holland, Mobberley, Knutsford, will be thankfully received and acknowledged."

Mr. Collins, whose honest labours in the little-cultivated field of economic botany are worthy of all encouragement, should be the last to depreciate the value of popular names. A closer study than he has made of them will doubtless convince him that they are of greater service to the working botanist than he seems at present inclined to concede. Besides the uses pointed out in my preface, above quoted, they furnish important data for the history of plants, and, in many cases, they serve as a guide to their native land, or the country where their uses were first discovered. We may search ancient records for the place whence the Sugar-cane was derived; no hints are conveyed; but in looking to the etymology of the name we recognize in "Sugar, Azucar, Zucker, Saccharum," only so many corruptions of a Sanskrit root, *çarkara*, directing our ideas into a quite new channel of inquiry, transporting us from the banks of the Thames, the Po, or the Rhine, to the sacred waters of the Ganges; from the nineteenth century to the remotest period of Indian history.

Many names are so euphonious, and constructed so cosmopolitically, —if that expression be admissible,—that they are readily received into different languages. Hence the extensive range which some enjoy, and their numerous modifications. From an opposite character a great, or rather the greater number, is very local. Such names as Coatzontecoxochitl will never pass beyond the lips of the nation that invented them; their very nature is opposed to it. Yet we must not condemn them on that account. However barbarous they may appear to those unacquainted with the language to which they belong, they assume a more favourable aspect in the eyes of the initiated, and, it is hardly necessary to add, are pronounced by them with as much ease as we do those belonging to our own native tongue.

How many vernacular names are formed is illustrated when a people exchange one country for another. The immigrant arrives at his new home full of high expectation; he not only hopes to have left behind all the discomforts of his native land, but also trusts to meet again objects which from childhood have been dear to him. Everything is examined,—the stones, the plants, the animals. The trees under the shade of which he used to sit, the fruits which in his boyish days he gathered are sought for. At last they are found. But lo! on closer examination they turn out to be similar, but not identical. He is disappointed, and his disappointment is for ever recorded in such names

as bear the prefixes of hog's, devil's, dog's, and others indicative of inferiority or contempt. But man is not permanently discouraged by disappointment. Certain substances are necessary to him, and a closer investigation is set on foot. The Spaniard settling in South America could not dispense with his Roble (Oak). In vain, however, did he search the forests; in the hot low lands it was nowhere to be found. A durable wood was required; experiments were made, and, ultimately, substitutes fixed upon to which the old name was transferred, though these belonged to very different species, genera, and even Natural Orders than does the Oak of his native country.

The meaning of vernacular names is not always clear. Many have been in use from time immemorial, and their origin is lost in the mist in which the early annals of our race are shrouded. Of others, however, belonging to a more modern formation, the sense is apparent, and we cannot, in many instances, sufficiently admire how well those names are adapted to the plants that bear them, and how well the most prominent features, the most striking peculiarities have been expressed. Daisy, the day's eye,—how appropriate for a flower only open between the sun's rising and setting! Macpalxochitlquahuitl, the Handflower-tree,—how characteristic of the plant, how evident to every beholder! Strawberry! how well this indicates the now prevailing practice of English gardeners laying straw under the berry in order to bring it to perfection, and prevent it from touching the earth, which, without that precaution, it naturally does, and to which it owes its German name—Erdbeere; making us almost forget that, in this instance, "straw" has nothing to do with the practice alluded to, but is an obsolete past participle of "to strew," in allusion to the habit of the plant.

B. Seemann.

NOTE ON *ABRUS CANTONIENSIS.*

By H. F. Hance, Ph.D., etc.

The possession of good fruiting specimens of this species, detected for the first time in Danes' Island, Whampoa, by one of my sons, enables me to complete its description, thus:—"Leguminibus oblongis compressis apice uncinatis v. apiculatis, seminibus isthmis cellulosis separatis oblongis compressis olivaceo fuscoque marmoratis,

strophiola conspicua cerina medio perforata, marginibus in annulum oblongum funiculum brunneum spiniformem legumini arcte adhærentem amplectantem elevatis."

In this plant the racemes are frequently so abbreviated that the purplish-pink flowers arise at the same level from the clavate or globular node-like termination of the branch, a mode of inflorescence precisely similar, though on a smaller scale, to that of *Canavalia*. When this character and that of the presence of *stipellæ*, before indicated by me, are taken into consideration, it will, I think, be admitted that *Abrus* would be better removed from *Vicieæ*, where Mr. Bentham has placed it in the 'Genera,' to *Phaseoleæ*, with which it was associated by De Candolle, and Wight and Arnott. *A. Cantoniensis* differs from its congeners by the conspicuously strophiolate seeds; but that this character is only of secondary importance, may be inferred from the fact that *Rhynchosia*, another Phaseoleous genus, includes species some of which have seeds with a caruncula, whilst others are destitute of that appendage.

AIRA ULIGINOSA, *Weihe*.

Erratum, p. 281.—By an awkward inadvertence on my part, the name of *Aira flexuosa* was written for the head-title of my communication about *A. uliginosa*. As the two specific names are rightly applied in the general text, and even the right authority given for the name in the head-title (*Weihe*, not *Linn.*), a botanical reader will easily infer that "*flexuosa*" was simply an error of the pen.

Hewett C. Watson.

NEW BRITISH PLANT.

Hieracium stoloniflorum, Waldst. et Kit., has been found by Professor Balfour and Mr. J. Sadler growing in great profusion on the Granton Railway banks, on Saturday, 16th October, 1869.

NOTE SUR LA FAMILLE DES ÉQUISÉTACÉES.

Par M. Eugène Coemans.

1. Les genres *Calamites*, *Annularia* et *Sphenophyllum* possèdent, tous trois, non-seulement des minces, mais aussi de grosses branches ou tiges.

2. Ces genres avaient, tous trois, un *wood-cylinder* intérieur, que nous confondons sous le nom de *Calamites*, et une écorce d'un parenchyme lâche et périssable.

3. Cette écorce était extérieurement lisse dans les genres *Calamites* et *Annularia*, du moins sur les grosses tiges ou branches. Pour les *Sphenophyllum* nous manquons d'observations bien sûres.

4. Cette écorce était extrêmement fine et transparente dans le g. *Annularia*. On la trouve parfois autour des tiges d'*Annularia radiata* comme une mince pellicule gazeuse, portant des traces de cellules qui rappellent celles des tiges de *Sparganium* et d'autres plantes aquatiques.

5. Les tiges nommées *Calamodendron* appartiennent certainement à un de ces trois genres. Mais auquel des trois ? Ces trois genres se rencontrent dans les localités où on a trouvé les *Calamodendron*. A leur forme on dirait que ce sont des rhizomes. Comme nous avons parmi les *Equisetum* vivants des espèces qui ont le rhizome solide, il se peut qu'il y ait eu à l'époque houillère des *Calamites* offrant dans leurs rhizomes une structure différente de celle de leurs tiges.

6. Les racines des *Calamites* et des *Annularia* se ressemblent complétement ; elles rappellent celles des *Arundo Phragmitis*, et autres plantes aquatiques. Les *Calamites* et les *Annularia* fournissent d'assez longs rhizomes avec des racines rayonnant de chaque nœud. Je n'ai pas encore vu de tiges de *Sphenophyllum* avec racines.

7. Les *Calamites* émettaient des stolons à angle droit avec le rhizome. J'en ai un de ces stolons d'un jard de long et sans nœuds.

8. Il n'est pas prouvé que les *Calamites* n'avaient pas sur leurs rhizomes des feuilles modifiées ou des espèces de gaînes. Ces organes devaient tenir à l'écorce qui a presque toujours disparu. On trouve même des fragments d'écorce de *Calamites* avec des feuilles avortées et paraissant parfois soudées à la base.

Le g. *Hippurites* a été formé pour de pareils fragments. Trouvé en Belgique et en Allemagne.

9. Le genre *Cyclocladia* ne se rapporte certainement qu'à des fragments de rhizomes, pourvus d'écorce et portant des cicatrices de grosses racines.

10. Le genre *Huttonia* n'existe pas ; on a donné ce nom à de jeunes vigoureuses pousses de *Calamites* ou bien à de robustes épis scapiformes.

11. Il y avait chez les *Calamites* des tiges dimorphes, ainsi la plupart des *Huttonia* sont des *scapi fructiferi.*

12. Il y avait chez les *Calamites* des ochréoles (*ochreola*), qui ont été décrits comme des gaînes d'Equisetites. J'ai vu au Musée de Paris un *Annularia* avec une ochréole à lobes arrondis.

13. Le genre *Equisetites* n'existe pas ; tout ce qui a été décrit comme *E. priscus*, *E. infundibuliformis*, *E. lingulatus*, *E. dubius*, se rapporte à différentes parties de *Calamites*, surtout à des *Calamites* garnis de leur écorce ou d'ochréoles.

14. Le *Calamosyrix Invicthaviensis* n'a rien de commun avec les *Calamites*, ce n'est qu'une tige de *Sigillaria* avec des cicatrices de racines adventives.

15. Le genre *Phyllotheca*, Brong., a été très-mal décrit par les auteurs ; c'est une vraie Equisétacée avec les gaînes des *Equisetum* et les feuilles des *Calamites*. Il forme une magnifique transition du genre antique au genre moderne.

16. Les tiges feuillues des *Calamites* et des *Annularia* sont souvent très-difficiles à distinguer :

Calamites, foliis 1-nerviis.

Annularia, foliis 1–3-nerviis, nervis parallelibus.

Sphenophyllum, foliis multinerviis, nervis dichotomis divergentibus.

N.B. L'*An. longifolia* montre souvent des feuilles à trois nerfs très-distinctes.

17. Les *Calamites*, les *Annularia*, et les *Sphenophyllum*, étaient des Equisétacées. J'ai des tiges fructifères de ces trois genres. Tous portaient des clypéoles garnis de sporanges, alternants avec des verticilles de feuilles plus ou moins modifiées.

18. Chez les *Calamites* il y a des *strobili* proprement dits, mais chez les *Annularia*, et les *Sphenophyllum*, les clypéoles se trouvent parfois à l'aisselle des feuilles des rameaux supérieurs. Les Equisétacées de l'époque houillère sont donc comme les Lycopodiacées, où les sporanges sont placés en épis ou simplement à l'aisselle des feuilles le long de la tige.

19. Le *Staphyllopteris alata*, Lesquereux, du Male's Coal-bank, dans l'Arkansas, n'est qu'une tige sporangifère du *Sphenophyllum saxifragæfolium*, privée de feuilles.

20. Dans les *Calamites* et les *Annularia* les feuilles des épis se réfractent parfois dans les épis mûres.

21. Les sporanges s'ouvraient à leur face interne, tournée vers le pédicelle du clypéole, comme dans les Equisétum vivants.

22. Chez les *Sphenophyllum* le nombre de sporanges attachés à un même clypéole varie dans la même espèce. J'ai trouvé des clypéoles aplatis portant 4, 5 et 6 sporanges.

23. Les sporanges étaient attachés, chez les *Sphenophyllum*, au bord du clypéole, comme dans les *Equisetum* vivants.

24. Chez les *Calamites*, les *Annularia* et les *Sphenophyllum*, le nombre de feuilles et de stries de la tige varient dans la même espèce, comme chez les *Equisetnm* vivants.

25. On trouve chez les *Calamites* différentes formes d'épis.

26. Je ne puis distinguer les épis isolés de *Calamites*, d'*Annularia*, et de *Sphenophyllum*, cependant les épis d'*Annularia longifolia* se reconnaissent à leurs gros sporanges arrondis.

27. Ordo EQUISETACEÆ.

1. Subordo, Calamiteæ.
    1. g. Calamites.
    2. g. Annularia.
    3. g. Sphenophyllum.
    4. g. Phyllotheca.
2. Subordo, Equiseteæ.
    1. g. Equisetum.

28. Je crois que les *Calamites*, les *Annularia* et les *Sphenophyllum* étaient des plantes aquatiques ou de marais.

1. L'écorce des *Annularia* indique une plante aquatique.
2. Les *Calamites* et les *Annularia* ont parfois des feuilles et des racines au même nœud.
3. Chez les *Sphenophyllum* on voit les feuilles se diviser et devenir capillaires au bas des tiges, comme chez les *Batrachium*.

EPILOBIUM OBSCURUM, *Schreb.*, IN ORKNEY OR SHETLAND.

In looking over a collection of plants made this summer in Orkney and Shetland by the Rev. C. L. Acland, I noticed specimens of *Epilobium obscurum*, Schreb., which is not included in Mr. Watson's 'Florula Orcadensis' (unless Niell's *E. tetragonum* be this plant), or in

Mr. Ralph Tate's 'Flora of the Shetland Isles.' Mr. Acland *believes* that it was gathered in the latter islands, and that *Euphrasia Odontites*, L., of which there were specimens, was also collected there; this is not included in Mr. Tate's paper. As *E. obscurum* has not been recorded from either group, it seems worth making a note of.

JAMES BRITTEN.

Royal Herbarium, Kew, W.

MEMORANDA.

DRIED FLOWERS.—We have been favoured by Mrs. Scrivenor, of Alvingham Rectory, Louth, Lincolnshire, with the sight of a group of flowers in which the colours have been exquisitely kept; and we should be glad to receive some dried Heliotropes, Forget-me-nots, and other *Boragineæ*, in which the colour is preserved with difficulty, as we do not find any of these plants amongst the group. As the process by which Mrs. Scrivenor has achieved her object may interest some of our readers, we subjoin a detailed description of it:—"A great mistake usually made by those who attempt drying flowers is to look upon weight and pressure as an essential part of the process. This is *the* chief cause of failure. To keep the colour in a flower, we should not take all the pains we can to squeeze out the juices in which that colour resides. All our efforts, then, must be given to retain the colour by drying up the juices, and *no more pressure must be used than will be required to keep the flower flat.* The flowers for drying must be free from all damp and dew. If it is possible, they should have had not less than seven or eight hours' sun upon them. Cut those only which have just arrived at the full perfection of their bloom; if at all past it, and beginning to fade, the drying process will fail to preserve their colour. Do not hold them when cut in your hands, but throw them as they are gathered into a large handkerchief lightly, so that they may not press one upon another. If the flowers are at all bruised or broken, it would be best to discard them at once, as the juice would escape through the injured part. When you have gathered your flowers, take them from their foliage, leaving the stalk to each flower from one to two inches long; light a candle, and hold the flower-stalks one by one in the flame, until about a quarter of an inch is quite burnt; this prevents the juice from escaping. Some flowers of a very bright red, purple, or magenta hue,—such as some of the Cinerarias, Pyrethrums, and those of a fleshy texture, such as the Dielytria,—require to have their stalks dipped from ten to twenty minutes in a weak solution of water and muriate of lime in crystals before burning; while very fleshy green leaves should have their stalks first put in a solution of saltpetre and water. Provide yourself with some blotting-pads. The size sold for 4*d.* or 6*d.* per quire will be found most con-

venient; and several quires of thin white blotting-paper. We will suppose we are going to dry Scarlet Geraniums, Periwinkles, single Magenta Stocks, and Laburnums, as they are some of the flowers most liable to change colour. Take your blotting-pad, raise the whole of the blotting-paper from the cover on each side. For the Geraniums, Periwinkles, and Stocks, take each bloom out singly, and, having burned the stalks as directed, bore a number of holes in one of the thicknesses of blotting-paper sufficiently large to admit the calyces of the flowers, and so far apart that, when the flowers are arranged, no one bloom shall touch another; pass the stalk and calyx of each flower through the pad, so that the petals of the flower shall rest flat upon the surface of the blotting-paper, and no part of them be pressed against the calyx. Arrange each truss of Laburnum (having passed its stalk through the pad) in such a manner that the blooms shall be distinct upon the paper; now lay the other thickness of blotting-paper over the petals, and, holding the two pads together, turn them over on one of the covers. Gently press down the stalks and calyces, which will now be uppermost, and shut down the other cover upon them; tie round and round both opposite edges of the pad with cotton, taking care to make all the edges meet perfectly. Prepare as many pads as you require in this manner; then prop them up at about a yard's distance from a bright fire, or put them in a very gentle oven. When one side of the pad is so hot that you can just bear your hand upon it, turn the other side to the heat, and repeat the process for an hour. Then open the pads, and examine the flowers; if they feel like smooth paper to the touch, they are sufficiently dried, but, if they have still any *fleshy* feeling about them, the pads must be reclosed, and the exposure to heat continued; but after the hour they must be carefully watched, the pads being frequently unclosed for the purpose of examination, as a very little *too much* heat will cause the flowers to scorch and turn brown. Some flowers will, of course, take longer drying than others even of the same kind; so that it is impossible to lay down any exact rules as to the time required; but no flower will need more than three hours. Great care must be taken in removing the flowers from the pad, as the process of drying renders them exceedingly brittle. The best method is gently to enlarge the holes on the side on which the stalks are, and, having seen that the stalks and calyces are free, to take hold of the petals on the other side between a small ivory folder and one finger, and draw the flowers out; put them away immediately between sheets of white writing-paper, taking care not to lay one flower over another. Remove the top sheet of blotting-paper from each side before using the pad again. Double flowers, such as Stocks, small Roses, Narcissus, etc., must have layers of cotton-wool or small pieces of blotting-paper placed between the petals, after they have been arranged in the blotting-pads, and before they are subjected to any heat or pressure. Calceolarias must have cotton-wool or very fine sand very carefully put inside each flower; the flower being just sufficiently filled to retain its shape without any fear of its bursting. The Fuchsia should have a part of its calyx passed through the paper, with a little cotton-wool put between the flower and the surface of the paper, and also between the corolla and sepals, so as to keep the form of the flower as much

as possible. Blue flowers in general do not require heat; you may put them between sheets of plain white blotting-paper, five or six sheets on each side, passing the stalks and calyces, as directed above, through holes made in one of the thicknesses, and subject them to just sufficient pressure to keep the flower from wrinkling. In the same manner, Ferns, white, and some variegated-leaved plants, such as Centaurea, Begonias, and Caladiums, may be treated. The fancy-leaved Geraniums require heat; but these, as well as other plants with variegated foliage produced by high cultivation, will often fail to repay the most careful treatment, as they are very apt to lose their distinctive markings under the drying process. For mounting the flowers you require a sheet of white cardboard, a pair of scissors or a penknife, gum, and a small camel-hair pencil. The gum must be *very strong*, and prepared as follows:—Take three ounces of gum arabic; pour upon it just sufficient hot water to dissolve it; then add a tablespoonful of spirits of wine. The greatest care and patience is required in the manipulation of the flowers; they must be taken up between the blade of your penknife and one finger. It is well to arrange them first on the cardboard without fastening them, and, having arrived at a satisfactory effect, to fix the arrangement in your own mind; then remove the flowers and proceed to build up your design, gumming the flowers one by one in the position you have assigned them. The smallest dab of gum in the middle of the back of the flower or leaf is sufficient to hold it in its place. A cardboard mount, round or oval, must now be placed on the cardboard on which the group is fixed, and the whole covered with a sheet of glass, and fastened round the edges so as to exclude the air. These groups may be framed as pictures, or mounted as fire-screens and table-tops. If hung up as a picture, it must be on a wall looking north; and, however they are used, care must be taken that the sun's rays shall not rest upon them. They must also be kept free from damp."

CORRESPONDENCE.

On a Poisoning Solution for Botanical Specimens.

Great differences exist in the strength of the poisoning solutions for herbarium specimens recommended in the various botanical text-books commonly in use by students. Thus, Desvaux and De Candolle advised spirits of wine wholly, Lindley the same, half saturated with corrosive sublimate, which latter proportion could scarcely be much less than a seventh or eighth of the weight of the spirit; Germain de Saint-Pierre directs the proportions to be 15 grammes of sublimate to the litre of spirit (= 231·5103 grs. troy to 1·7608 imp. pints); Duchartre, a solution of double this strength; whilst Balfour recommends half a drachm of sublimate to each ounce of camphorated spirit or naphtha.

Dried plants are unusually subject to the attacks of insects in southern China, especially during the south-west monsoon, when the temperature is

high, and the air frequently surcharged with moisture. Duplicates and other unpoisoned specimens then require the greatest attention, and, unless carefully protected from access to the air, become moulded, and too frequently overrun and in a week or two partially devoured by insects.

It may not be unacceptable to working botanists to have a recipe which, under these unfavourable conditions, I am accustomed to use in my own herbarium; and which, after nearly twenty years' experience, I can testify to as being entirely efficacious in preserving all plants to which it is thoroughly applied from the incursions of their troublesome little enemies. It is as follows:—

Rectified spirit . . .	16 fluid ounces.
Corrosive sublimate .	6 drachms.
Creasote	40 drops.

Let the mixture stand, agitating occasionally, until the sublimate is dissolved and, when required for use, dilute with an equal volume of hollands, or, if more convenient, proof spirit.

H. F. HANCE, PH.D.

BOTANICAL NEWS.

Professor Asa Gray is returning early this month to his native country, after a tour in Europe.

Dr. Hooker, we hear, is actively at work in preparing a new British Flora.

From Professor Behn we have a pamphlet, written in reply to some remarks of Dr. Küchenmeister, on the proposed reforms of the ancient Imperial German L. C. Academy Naturæ Curiosorum. There are two diametrically opposed views held about this matter. The one party hold that only such men as have already won their laurels elsewhere should be admitted into the Academy, the other think it is the special business of the Academy to search out promising young men for admission, and thus give them an opportunity of bringing forward the result of their labours. The latter have certainly the ancient charter on their side. There is much to be said on both sides of the question. It may appear a greater honour to be admitted into a scientific body when only long-established reputation is a passport for admission, but few men will appreciate it to its full extent after they have passed through all the drudgery without the support of a patronizing corporation, and still fewer of that class will regard it as a fresh spur to exertion. On the other hand, by admitting promising, untried men, great mistakes may be made. Humboldt acted on the latter principle: he mainly looked to the rising scientific generation, and to that he gave his principal support. He had the keenness to single out Liebig when the latter, perfectly unknown to fame, was reading a short paper, and he was equally fortunate in many others whom he countenanced, but he is admitted tohave fallen also into some sad mistakes.

W. G. Smith del. et lith.

Vincent Brooks Day & Son, Imp

Tab. 99

W.G Smith, del. et lith.

Vincent Brooks, Day & Son, Imp.

PEZIZA (DISCINA) MACROCALYX, *Riess*; A NEW BRITISH FUNGUS.

By Worthington G. Smith, Esq., F.L.S.

(Plates XCVIII. and XCIX.)

This fine *Peziza* was found by my friend Mr. J. Aubrey Clark, of Street, Somerset, in March of the present year. It grew in a Fir wood at Street in some plenty, and the specimens were half buried in the ground. I am indebted to Mr. C. E. Broome for the name and a reference to Fresenius' 'Beiträge,' p. 75, where it is described and indifferently figured in outline. The following particulars, freely translated from the German, exactly accord with the Street plants.

"This fungus is found underground in forests of Fir-trees singly, or from two to five together; in its progressive development it rises about one-half out of the ground. At first it is closed, but later it splits star-like from the top downwards to the middle of its cups, or sometimes even further down still, into from seven to ten more or less pointed strips. The exterior is a dirty pale blue, clothed with a thin white transient fur, and at the base of the cup is a short stem. In large-sized specimens the cup itself reaches a height of three inches, with a similar breadth, deeply cup-shaped with the rim at length bent outwards. Its substance consists of a soft, spongy tissue, composed of very large cells, elongated on the outside, and growing more and more globular towards the inner side, attaining a thickness of one line. The inside of the cup is covered by the hymenium of at first a pale, and later a dark violet, formed of tubular, truncated asci, each containing eight elliptical sporidia one quarter of a millimetre long, and of branched, articulated paraphyses of the same length: each sporidium containing one or two drops of oil. This *Peziza*, to judge from the figure in Greville's 'Scottish Cryptogamic Flora,' is closely related to *P. vesiculosa*, and might even be taken for a variety of that species were it not for several reasons against it. Besides its different place of growth, it differs especially in the colour of the hymenium, and the peculiar shape of the paraphyses."

It was originally my intention to have written a paper for the 'Journal of Botany' on abnormal growth of Fungi, and their bearing

on the structure and morphology of *Agaricus* and *Boletus;* and Plate XCIX. was to have been one of a series in illustration of the subject, but as the other subjects (some of them of a diagrammatic nature) are not lithographed, I must content myself by merely explaining at the end of this paper the first figures here published.

The following rare species of Ascomycetes Fungi have passed under my observation during the present year:—

Peziza (Discina) onotica, P.—Ringwood, Hants. The Rev. W. H. Lucas.

P. (Sarcoscypha) radiculata.—In great abundance on a hedgebank near my own residence. The vivid yellow colour of this species gave the bank the appearance of being covered with yellow crocuses.

P. (Sarcoscypha) lanuginosa, Bull.—This recent addition to our flora came up in several places under cedars in March and April last, notably at Guy's Cliff, Warwick, and in the neighbourhood of Ware, Herts. It was, however, totally absent from its original station at Fetcham Park.

Morchella crassipes, Pers.—I found several specimens of this gigantic morel in the spring, in the woods about Little Munden, Herts.

Explanation of Plate XCVIII.—Figs. 1, 2, 3, *Peziza (Discina) macrocalyx*, Riess; 4, section of ditto; 5, asci and paraphyses, × 300 diam.

Explanation of Plate XCIX.—Fig. 1, *Russula alutacea*, Fr.; 2, *R. furcata*, Fr.; 3, *Agaricus (Omphalia) muralis*, Sow.; 4, *Marasmius oreades*, Fr.; 5, (*Collybia ?*); 6, *Russula heterophylla*, Fr.; 7, *Boletus edulis*, Bull.

WHAT IS THE THAMES-SIDE BRASSICA?

By Hewett C. Watson, Esq.

A species of *Brassica* occurs in many places along the Thames, on both sides of the river, and on its intervening islets, where it separates the counties of Surrey and Middlesex. The plant may be held thoroughly established there, if not an aboriginal native, extending its occupancy from the immediate margins and osier-grounds of the river to the ditch-sides and hedgebanks of the adjacent fields. Botanists are not agreed on the specific name which this plant ought to bear, several of them having entirely mistaken the species itself, and thus having misapplied to the plant of the Thames side the name belonging to a different species, to one which is most likely neither native nor well-

established in Britain, and which has never been found in Surrey by me, although a resident for thirty years and upwards.

In the original 'Botanist's Guide' of 1805 Mr. Borrer wrote of the plant thus:—"*Brassica Napus?* What appears a remarkable variety of this species, with erect siliquæ and bristly leafstalks, grows about the Thames at Hampton and Kew." Thirty years later, in the 'New Botanist's Guide,' we find the plant reported by Mr. Winch under a different name, thus:—"*Brassica campestris.* By the Thames, near Hampton, abundantly, 1829." In the Supplement to the latter work, dated 1837, the same plant was reported on my own observation thus:—"*Brassica campestris.* A plant presumed to be this species, grows in plenty on the sides of the Thames for several miles, both above and below Ditton." This description would include the locality of "Hampton," previously recorded by the two older botanists named. I turn now to records of recent date.

The 'Flora of Surrey' is dated in 1863; being a posthumous work, edited from materials left by Mr. J. D. Salmon, and saved to science through the judicious liberality of Mr. W. W. Saunders. Doubtless the editor would feel unwilling to alter the notes of localities which had been collected by Mr. Salmon, unless on the clearest evidence of errors. Hence, probably, the confusing inconsistency in the Flora named, where this one Thames-side *Brassica* comes twice, as if two different species, and under two different specific names. It is there entered secondly as *Napus*, on the authority of Mr. J. T. Syme and Mr. J. S. Mill, having been also given firstly as *campestris* from my own notes to the editor.

In 1869 we have the 'Flora of Middlesex,' by Trimen and Dyer, a work highly creditable to its authors. Unfortunately, in their attempt to set us right about this plant, they have adopted the error and rejected the truth. They treat the species as certainly *Napus*; correct the supposed blunder of Winch in calling it *campestris*; ignore my own record of this latter plant in the Supplement above quoted; and declare that they have not observed *B. campestris* in Middlesex. As the plan of their Flora does not include descriptions, but gives only the names of species, and as its authors state no reason for their own reference of the plant in question to *Napus* instead of *campestris*, we must seek elsewhere for a test of their correctness or otherwise in thus deciding.

Apparently, there is the excellent authority of Mr. Syme for the name which is adopted in the 'Flora of Middlesex;' but Mr. J. T. Syme's use of the name is quoted from a record in the 'Phytologist' so long back as 1852. I recognize in the present Mr. Boswell-Syme, of 'English Botany,' third edition, our best living authority for the nomenclature and description of British plants. And I propose here to show, in reliance on his own words, that he could not possibly now refer the Thames-side plant to *Napus*, although he may erroneously have done so in 1852, through not then having become familiar with it in its early growth,—say, between August and April. In the third edition of 'English Botany,' in which the descriptions of our British plants are so ably re-written by its editor, we find an aggregate *Brassica polymorpha* subdivided into three segregates or subspecies, which are thus distinguished by their diagnostic characters and places of growth:—

(1.) *Brassica Napus* —Leaves all glaucous and glabrous. Flowers remaining till the corymb expands into a short raceme.—A weed in cultivated ground, or more frequently the remains of a field of Rape- or Cole-seed.

(2.) *Brassica campestris.*—Leaves all glaucous, the radical ones hispid, the rest glabrous. Flowers falling off before the corymb lengthens into a raceme.—A weed in cultivated ground, and by the banks of rivers and ditches. "Swedish Turnip."

(3.) *Brassica Rapa.*—Radical leaves green not glaucous, hispid; stem leaves glaucous and glabrous. Flowers falling off before the corymb lengthens into a raceme.—A straggler in cultivated ground, usually the remains of a field of Turnips. "The Turnip."

The editor remarks on the difficulty of distinguishing his third subspecies from the other two, and he states that *B. campestris* is the only one which can be considered at all "well established" in this country. Yet, if the characters assigned to the first subspecies are correct, it should be easy to show that the Thames-side plant cannot be *Napus*, whatever else it may be pronounced. Its radical leaves are neither glaucous nor glabrous, being dark grass-green and much hispid; and the petals fall early, leaving the elongated raceme formed of young pods, not of flowers. How thus can it be *Napus?* Surely not because it wants all the three distinctive characters attributed to *Napus!* Moreover, it is not simply "a weed in cultivated ground,"

or only the remains of a field of Rape- or Cole-seed," for it has been many years "well established . . . . by the banks of rivers and ditches."

But is the specific name *campestris* any more correct than the one here discarded? This question can hardly be answered off-hand in the affirmative, because it involves a decision whether the name of *campestris* applies to the wild state of the *Rape* or the *Swede* or the *Turnip*. It is evident that Mr. Boswell-Syme has described the Swede for *Brassica campestris*, and has assumed that our "well-established" Thames-side plant is the wild state of the Swede, not the wild state of the common or true Turnip. But its grass-green (not glaucous) and bristly radical leaves negative the assumption. My conviction is, on a familiarity with the plant during thirty years, that the Thames-side *Brassica* is simply the wild stock of the true Turnip, scarcely differing from this latter except by the non-enlargement of the root into an esculent globe. On dry banks exposed to the sun the radical leaves are more hispid than usual in the cultivated varieties, and they frequently acquire a dark or purplish tint, which is not at all glaucous; but in damper ground they have the grass-green hue of the Turnip, and are less hispid.

Whatever is done with the Swede, the position of *campestris*, as the wild stock of the Turnip, seems to be in accordance with the views of most botanists. In the 'Manual of British Botany' Professor Babington places *Rapa* as a variety of *campestris*, and distinguishes it only by its "root caulescent fleshy," words, indeed, that would better describe the Swede than the true Turnip, for the esculent enlargement of the former is continued upwards somewhat into the stem, while that of the true Turnip is entirely radical. In the 'Summa Vegetabilium' Fries also places *Rapa* as the cultivated variety of *campestris*. A similar view is adopted by Grenier and Godron in the 'Flore de France,' and by Koch in the 'Synopsis Floræ Germanicæ,' though their nomenclature differs. The French authors follow Lamarck in using the expressive name *asperifolia* for the species, making *campestris* (L.) its type form, and *Rapa* the esculent-rooted variety. The German author uses the name *Rapa* for the species, but equally makes that of *campestris* (L.) apply to the type form.

There is some confusion, however, through treating typical *campestris* as an annual, and describing the annual form as and for the

species, as if the biennial form were a divergent variety. Seeds which germinate in spring, among corn or elsewhere, produce plants which soon run up to a stem, and which (on that account?) have more simple and less hispid leaves than are usually seen as radical leaves on the biennial plant. As we see the species by the Thames side the seeds germinate and become plants early in the autumn. These live through the winter, and flower in the succeeding spring or summer. They have a tuft of green and rough radical leaves, which are more lyrate-pinnatifid than the leaves of the annual form. As the flowering-stem rises from this winter tuft in the following spring, the leaves produced on it are smooth and become glaucous in hue, especially upwards. This biennial form seems to be the true type for the species; at any rate, it is so in our climate.

A confusion between the wild states or stocks of *Napus* and *Rapa* is of ancient date. Possibly the crossing of names in the two languages may have somewhat contributed to the confusion in England, where we cross-translate *Rapa* or *Rapum* into Tur-*nep* (the old and correct spelling), and *Napus* into *Rape.* Near two centuries ago Ray thus wrote under the head of "Napus sylvestris." . . . "Est hæc fortasse Rapum sylvestre non bulbosum Lobelii *Adv.* Certè planta illa quæ in insula Eliensi seritur, unde oleum *Rape Oil* dictum exprimitur, huic eadem videtur; proinde Rapum sylvestre et Napus sylvestris una eademque fortasse planta sunt; quòd si diversæ fuerint, quam pro Napo sylvestri hactenus habuimus, Rapum potiùs sylvestre censenda est: siquidem Napus sativa nobis peregrina est; quidni et sylvestris?" ('Synopsis,' ed. 2, p. 167.)

What *Napus sylvestris* may be it is not in my power to say, never having seen a wild Rape; but, if asked by any modern Ray to point out what *Rapum sylvestre* is, my reply would be,—the wild form of the Turnip, the biennial *campestris*, the rough-leaved Thames-side *Brassica.*

ON A NEW SPECIES OF *OREOPANAX*, FROM CHONTALES, NICARAGUA.

By Berthold Seemann, Ph.D., F.L.S., etc.

The genus *Oreopanax* is not numerously represented in Nicaragua. In the pine region of the mountains of New Segovia and Matagalpa,

I only noticed on rivulets one species, which goes there by the names of "Manu de Leon" and "Pata de Danta," in allusion to the shape of the leaves, which are sufficiently large to be useful for wrapping up cheese, soap, etc. It is about 30 feet high, and has palmate leaves, tomentose-pubescent on both sides, and with pinnatifid lobes. The flowers are whitish. It may possibly be *O. Guatemalense*, of which I have not yet had an opportunity of seeing an authentic specimen, and I will therefore leave it in abeyance. But a second species is very plentiful about the Javali Mine, in Chontales. It is so much like *O. capitata*, that at first I mistook it for that widely diffused species, until I remembered that *O. capitata* is an erect tree, whilst this species is an epiphyte, which, like some of the *Ficus* of the country, closely embraces a tree by its stout roots, and gradually kills its host both by its weight and by stifling it. It was from a tree that had thus been killed I obtained fresh specimens of this species, which I named :—

O. destructor (sp. n.), Seem.; epiphytum; petiolis elongatis (3–6 unc. long.), foliis oblongis v. obovato-oblongis acuminatis, basi cuneatis, apice abrupte acuminatis, integerrimis, venis primariis 3, 2 lateralibus angulum acutum formantibus, utrinque glabris, supra lucidis; floribus racemoso-paniculatis; pedunculis pedicellisque pubescente-tomentosis; drupis obovatis obtusis (nigris). — Nomen vernaculum Chontalense "Tempisque montañero" (v. v. sp.).

Branches stoutish, terete. Leaves alternate, the two lateral veins extending beyond the middle of the blade. Leaves perfectly glabrous in fruiting specimen, and on upper surface shining like those of Ivy. Inflorescence terminal, the fruiting heads composed of 3–5 drupes, the latter crowned by several styles. Perfect flowering specimens I have not seen.

The natives informed me that about Leon (Nicaragua) there is a Tempisque, which however is a tree, used in processions on Palm Sunday, the fruit of which is eaten. It may possibly be *O. capitata*, which if memory serve me right, I have noticed about that city.

Oreopanax Xalapense, Dcne. et Planch., has lately been named *Monopanax Ghiesbreghti*, Regel, Gartenflora, 1869, p. 35, t. 606: the author having mistaken an abortive ovary of a male flower, with its consolidated styles, for a fertile ovary of a hermaphrodite flower, thus has failed to recognize the genus *Oreopanax*.

NOTE ON *AIRA SETACEA*, *Hudson* (*A. ULIGINOSA*, *Weihe*).

By Henry Trimen, M.B., F.L.S.

(*Botanical Department, British Museum.*)

In the Banksian herbarium is a grass labelled by Sir Joseph Banks "*Aira setacea*, Cawston decoy, 12 miles north of Norwich—Mr. Briant, 1776." It is the plant known by modern botanists as *Aira uliginosa*, found in France, Germany, and Russia, and to which attention has lately been directed in this country by Baker, More, and Watson (*vide* 'Journal of Botany,' Vol. IV. 176; Vol. V. 72; Vol. VII. 265, 281).

A. setacea was founded by Hudson (Fl. Ang. ed. i. 30) on a plant collected by Mr. Stillingfleet on Stratton Heath, Norfolk, a locality a few miles distant from Mr. Briant's, above quoted. A specimen from "Stratton Heath, 1780," is in the Smithian herbarium, on the sheet labelled "*A. flexuosa*, *β*, Fl. Brit.," but is too young for complete identification. In the second edition (p. 35) Hudson refers the plant to *Aira montana*, L.; he repeats the Norfolk station, and adds that the plant is common on sandy heaths in Yorkshire and Lancashire. A detailed description is given, from which it is evident that the species intended is *A. uliginosa*, of Weihe; the long acute membranous ligule, the smaller more erect and closer panicle, the equal glumes and stalk to the upper floret being all mentioned. It is thus also evident that the specimen in the Banksian herbarium is correctly named.

A. montana of Linnæus, to which Hudson subsequently referred the plant, is in all probability a mountain form of *A. flexuosa*, with darker glumes and a more contracted panicle. The short diagnoses in Fl. Lapp. 49, Fl. Suec. 25, and Sp. Plant. ed. i. 65, are insufficient for certain determination, but the reference to Scheuchzer's 'Agrostographia,' 216, and the habitat given, in dry sunny places, tend to show that the grass meant was not the one in question. Unfortunately the Linnæan herbarium throws no light on the subject, the three specimens named *A. montana* being, according to Colonel Munro (Journ. Linn. Soc. Bot. vi. 42), all different, and all members of other genera than *Aira*. In Scandinavia this alpine form appears to be very common, and Fries states that there exists a complete series of plants connecting *A. setacea* (*uliginosa*) with it. The two plates (107, 108) in Parnell's 'British Grasses' represent such northern states of *A. flexuosa*, some-

what approaching *A. setacea*, but obviously distinct from it. It is possible that Fries is not acquainted with true *A. setacea*. The *A. montana* of Dickson's Hortus Sicc. Brit., from "the mountains of Scotland," is, however, certainly *A. setacea*.

It appears then, that Hudson's name remains good, and must stand as that of the species. The synonymy is as follows :—

Aira setacea, Huds. Fl. Ang. ed. i. (1760), p. 30.

A. montana, Huds. Fl. Ang. ed. ii. (1778), p. 35 ; Dicks. Hort. Sicc. Brit. fasc. 18 (1802), p. 4 (non L.).

A. flexuosa, var. *β*, Sm. Fl. Brit. (1800), i. p. 85, and Eng. Fl. (1824), i. p. 104 (excl. reference to Leers, whose figure is clearly *A. flexuosa*).

A. scabro-setacea, Knapp, Gram. Britt. (1804), t. 32.

A. uliginosa, Weihe in Bönninghausen, Prod. Fl. Monast. (1824), p. 25.

Deschampsia Thuillieri, Godr. and Gren., Flore de France (1855–56), iii. p. 508 (includes also *Aira discolor*, Thuillier, which Boreau (Fl. du Centre, 700) considers distinct from *uliginosa*).

The plant has occurred in this country in the following localities :— Stratton Heath, Norfolk, Mr. Stillingfleet (Hudson and Herb. Smith !) ; Cawston decoy, Norfolk, Mr. Briant (Herb. Mus. Brit !) ; Fleet Pond, North Hants (H. C. Watson ; Angusshire, Mr. J. Mackay (Herb. Smith !) ; Forfar Heath, G. Don (Knapp) ; near Forfar, G. Don (Herb. Kew. et Winch, *fide* Baker) ; Loch of Drum, Aberdeenshire (Herb. Mus. Brit. !) ; Cregduff Lough, Roundstone, Connemara, A. G. More (Herb. Mus. Brit. !).

SOME ACCOUNT OF CHESHIRE RUBI.

BY THE HON. J. B. LEICESTER WARREN, M.A., F.L.S.

This attempt to put on record the various *Rubi*-forms which I have up to the present time personally observed in Cheshire is merely similar to what Mr. Briggs has done for the Brambles of Devon. I am convinced that, when the distribution of our native subspecies of *Rubi* has been properly investigated, much subsidiary light will be thereby thrown upon the study and discrimination of these difficult plants. Trying some years ago to make a list of Cheshire

plants I found, late in my labours, a complete hiatus at the genus *Rubus*. I had left Brambles till the last, and very unwillingly I set about them. They soon, however, became interesting; and I really believe that much of the disgust with which many excellent botanists regard Brambles would disappear if they only gave them a fair trial. My provincial list of *Rubi* is as yet very incomplete, but I am inclined to think that even in its present state, it may assist somewhat local inquiries. I may state that in no instance have I named a subspecies on my own authority. Mr. Bloxam and Mr. Baker, without whom this list would never have been composed, have always been most kind in naming forms submitted to them. Still, the person who sees these plants growing, and at his door, is at an immense advantage over even the best rubiologist, who merely sees dried and often imperfect specimens. Therefore, whatever errors occur in the present list, I am solely responsible for. And therefore, though the assistance I have derived from Messrs. Bloxam and Baker is immense, I distinctly do not wish to make them responsible for any false record, for which solely this paper and its writer have to answer.

The districts are the county hundreds, viz. (1) Macclesfield, (2) Bucklow, (3) Eddisbury, (4) Wirral, (5) Broxton, (6) Nantwich, (7) Northwich. District 1 is the present electoral division of East Cheshire; 2 and 7 comprise Mid-Cheshire; 3, 4, 5, and 6, West Cheshire. With Mid-Cheshire I am best acquainted. District 4 and the north of district 3 are the littoral parts of the county. With very few exceptions all the names, even of farms, which I use may be found in Cassell's fourpenny County Map of Cheshire.

1. *R. Idæus*, L.—General and prevalent. (2.) Common in this district. (3.) Oakmere. (4.) Parkgate. (5.) Broxton Hill. (7.) Peover Heath. The ternate-leaved form grows in the Willow Bed, Tabley.

2. *R. fissus*, Lindl.—I have as yet never seen true *R. suberectus*, Anders., in Cheshire. *R. fissus* seems mainly to take its place. I suspect this form will certainly occur in all our hundreds. (1.) Lindow Common. (2.) Pickmere Moss, abundant. (7.) Rudheath, plentiful; roadside, a mile south-east of the "Three Greyhounds."

3. *R. plicatus*, W. and N.—(1) Lindow Common, north-west end; less common there than *R. fissus*. (2.) Knutsford racecourse, good and typical; Tabley Hill sand-pit. (7.) Sparsely on Rudheath, and untypical, on the Lower Peover side of the 'Three Greyhounds.'

4. *R. affinis*, W. and N.—A decidedly northern Bramble, and here generally and commonly distributed. Very ericetal in its stations, like the two previous forms. This is, when dried, sometimes hard to distinguish from the *R. rhamnifolius* of Surrey heaths, but in a growing state these *Rubi* seem to me sufficiently distinct. (1.) Between Stockport and Mottram, near Macclesfield. (2.) General, *e. g.* Tabley Lake side. (4.) Near a quarry between Eastham Hotel and Bromborough Park wall. (7.) Back Lane, Lower Peover, and Rudheath, abundant. Mr. Baker has established the identity of this prevalent Yorkshire and Cheshire form with *R. nemoralis*, Müll. (See Genevier, p. 188.)

5. *R. Lindleianus*, Lees.—A most prevalent and unmistakable form. (2.) Very common. (4.) Heswall Hills, near Parkgate. (7.) Lower Peover, common.

6. *R. rhamnifolius*, W. and N.—Embracing here a range of several forms, of which the shade ones require more attention, which, if we combine the subspecies, is hereabouts sufficiently general. I doubt if some of these do not rather belong to *R. calvatus*, Blox., so I shall only give the distribution of a form which is certainly *rhamnifolius* with *flat*, broadly-ovate, cuspidate, and cordate terminal leaflets densely-grey felted beneath. (1.) Tabley Lane on Tabley Hill; hedge just above the sand-pit. (7.) Peover, back lane, near the Brook, and Rudheath.

7. *R. discolor*, W. and N.—Curiously partial and local in Mid-Cheshire, where it bears marks of accidental importation, occurring near canals, tan-yards, railway stations, etc., and seldom in fields or hedges removed from the highway roads. As, however, we approach the hilly districts of East Cheshire, or the sea towards the west, it becomes gradually more abundant. In Wirral and North Eddisbury, that is to say, in littoral Cheshire, it is the prevalent Bramble. All the *discolor* of Central Cheshire, which I have yet carefully examined, seems to me the smaller, less pilose, more stunted *R. rusticanus*, Mercier, and not the true *discolor* of W. and N. so general round London, for example. The nearest Cheshire plants to this last I gathered near Biley, Middlewich, a district in its vegetation much more markedly southern than Knutsford, though not so many miles from it, as the general occurrence there of *Acer* and *R. cæsius*, L., shows; but, not having seen the Biley *discolor* in flower, I do not wish to record true *discolor*

in Cheshire at present. (1.) Near Macclesfield, general. (2.) Quite local, *e. g.*, tan-yard, Higher Tabley; more abundant towards Lymon, Carrington, Thelwall, and the north. (3.) General; Weaverham, Tarvin, Tarporley. (4.) The prevalent form; Eastham, Hoylake, Wallasey, Moston. (7.) Still local in the north of this hundred, but occurs at Lower Peover; plentiful near Biley; Peover, back lane.

8. *R. leucostachys*, Sm., *β. vestitus*, Weihe.—Very fairly general; common round Knutsford. (1.) Observed by the road between Stockport and Mottram. (2.) General; Tabley Hill Lane. (4.) Just below Heswall hills, in a quarry near the town of Heswall. (7.) Back lane, Lower Peover.

9. *R. Salteri*, Bab., *β. calvatus*, Blox.—I find I use this name to include more than Mr. Baker does by it. So, though I suspect this is an abundant Cheshire form, I shall, for the present, only record the *calvatus* of Tabley Hill Lane there named on the spot by Mr. Bloxam. The plant here bears a strong, markedly flexuous rachis, and is green, not white- or grey-felted beneath the leaflets. (2.) About fifty yards on the Knutsford side of Tabley Hill sandpit.

10. *R. ramosus*, Blox.—Observed in Tabley Hill Lane, where it is fairly abundant, by the original describer of this species. I have only seen it also in a Plumbley lane towards Arley, some three miles distant from the first spot. Both places are in district 2. This form appears to me to be allied both to *R. calvatus* and *R. Lindleianus*. (2.) Tabley Hill Lane; but apparently not more than six or seven bushes. (7.) Fairly abundant in a hedge which joins a pathway at Lower Peover Heath Green.

11. *R. carpinifolius*, W. and N.—(2.) In a hedge which meets the turnpike road between the Grange Farm and the "Smoker Inn," Plumbley; round Wood Tabley, etc.; or, neither place being on Cassell's map, say half a mile nearer Northwich than where the Waterless Brook crosses the turnpike road. (4.) Observed at Gayton, close to the Hall; recorded by me in the 'Liverpool Flora' as *R. amplificatus*, Lees.

12. *R. villicaulis*, W. and N.—(7.) A single bush, in a rough waste bit by the roadside soon after Lower Peover Heath, towards Rudheath. I only added this subspecies to my Cheshire list in October this year. I had never seen it before in this county.

13. *R. macrophyllus*, W., *a. umbrosus*, Azzh.=*R. carpinifolius*,

Blox.—A general form in Cheshire; with flat, orbicular, cordate, cuspidate, hard, short-felted terminal leaflets, coriaceous, approaching *rhamnifolius* in many respects. In Sussex, Middlesex, and Surrey the terminal leaflet is generally only broadly ovate-acuminate, the point being attenuate, and curved sidewards, while below the leaflets are much more softly yet thinly clothed. The last form also occurs in Cheshire, but the orbicular cuspidate leaflet is the rule, the last the exception. (2.) Every hedge-lane near Knutsford; occurs also often as an isolated bush in their pasture margins. (4.) Near Bromborough Park wall, near Eastham Hotel. In 'Liverpool Flora' given as *carpinifolius*, that is, of Bloxam, not Babington. (7.) Biley; Lower Peover; very general.

14. *R. macrophyllus*, W., δ. *amplificatus*, Lees.—Not very typical, but still satisfying, I think, the name. The beautiful form of Thames Ditton, Surrey, and Bishop's Wood, Hampstead, may be taken as the type. (2.) Armstrong's Cover, Tabley, that is, the wood near Tabley Lane end, and sparsely in Round Wood, Tabley; apparently not common, but naturally. Except at home, I have had less access to wood forms than to roadside ones. I can give a better account of the septal than the sylvatic forms. Where game is much preserved, coverts are forbidden ground.

15. *R. mucronulatus*, Boreau.—I have only observed this on the Mow Cop range, which bounds Cheshire to the south. Once ascending the chain directly from the town of Congleton, where you come upon it by the roadside to Biddulph about a mile or so from the station, and again at the village of Mow Cop, some miles to the south-west. It is a form with a hill tendency. (5.) Hills above Congleton.

16. *R. Sprengelii*, Weihe, α. *Borreri*, Bell-Salt.—A prevalent Bramble of Cheshire heaths. (1.) Near Mottram. (2.) Common; Round Wood, Tabley; Pickmere Moss. (7.) Rudheath; Lower Peover Heath. Any London botanist may see this form between the "Spaniards," Hampstead, and Bishop's Wood; and again sparsely on the heath before you come to the "Spaniards."

17. *R. scaber*, Weihe.—(2.) Roadside above Clayhouse Farm, Plumbley; Round Wood, Tabley, very fine bushes; Tabley Garden Wood. (4.) A single bush, near the wall of Bromborough Park, Eastham side.

18. *R. rudis*, Weihe.—I have only observed this well-marked form in

one lane and the adjacent field-hedges, where, however, there is plenty of it over an area of a few acres. Mr. Baker says of these specimens that they are unusually typical for the north of England. (2.) On Morrey's farm, Bexton (in the Ordnance and Cassell's maps, "Black Hill Farm"), near Knutsford. I suspect local in Cheshire.

19. *R. Reuteri*, Mercier.—(2.) White House Farm and the Grange Farm, Plumbley; plentiful in company with *R. rudis* on Black Hill Farm, Bexton; thinly but generally scattered over all this immediate neighbourhood. Like *Hypericum pulchrum*, seldom much of it in one place, but nearly everywhere sparsely. An enormous bush, however, on the Grange Farm, near the Waterless Brook. This is a coarse radulesque form, evidently to be placed between *R. rudis* and *R. Radula*. A year or two ago I named it *R. saxicolus*, Müll., from a Continental specimen in Mr. Baker's collection. I have lately found that M. Genevier, in his '*Rubus* du Bassin de la Loire,' states that Mr. Baker's coarse Yorkshire *Radula*, which I hold identical with the Cestrian, is thus to be named. His description sufficiently fits, and he notices the alliance to *R. saxicolus*, Müll. Mr. Bloxam seems inclined to put this form to *R. Radula*, *β. Leightonii*, Lees.

20. *R. Radula*, Weihe.—Rather a local *Rubus*, in Mid-Cheshire, and seldom typical. (2.) Laneside, towards Arley, in Plumbley, near Trout Hall, Plumbley. (7.) Rudheath, in company with the *R. fissus*, in an exposed heathy spot. These specimens are, according to Mr. Baker, "excellent typical *Radula*," and, indeed, the only quite typical *Radula* I ever got in Cheshire.

21. *R. Kœhleri*, Weihe.—Local. (2.) In the hedge by the laneside, one hundred yards south of Flitto Gate Farm, where it grows very densely for thirty or forty yards.

22. *R. infestus*, Bab.—Rather local. (2.) Sparse bushes, in Tabley Hill Lane. Finest bushes by the road which crosses the Cheshire Midland line, beyond Morrey's Farm, or Black Hill Farm, Bexton. (7.) Roadside, between Bradshaw Brook and Rudheath.

23. *R. pallidus*, Weihe.—Very common; the general undergrowth of plantations in Cheshire; the weak forms puzzling and easily mistaken for Bellardine Brambles. (1.) Disley and Whaley Bridge. (2.) Very common. (4.) Near Eastham. (6.) Near Crewe station. (7.) Lower Peover, Rudheath, etc., general.

24. *R. diversifolius*, Lindl. = *dumetorum*, δ. *ferox*, Lees.—(1.) Dis-

ley, Lindow, near Stockport, on the Mottram Road. (2.) The common hedge Bramble of the district. (6.) Near Crewe Park Gate. (7.) Lower Peover, Rudheath, very prevalent.

25. *R. diversifolius*, Lindl., var. *concinnus*, Baker = *nemorosus pilosus* (*fide* Bloxam).—(2.) Near Trout Hall Farmhouse, in the lane, on both sides; again in Four Lane End, Plumbley, etc.; in hedges all about Plumbley Moor. (7.) All about the Back Lane, Lower Peover; also near the old Fox Covert.

26. *R. fuscus*, W. and N.—(2.) Enter Smoker Hill Farm, Plumbley, from the Norwich road, pass through it, and search the first large field-hedge to the right. This farm is unmarked; it is a little on the Manchester side of the 'Smoker Inn,' in Watling Street. (7.) Roadside, just short of the firs, at Rudheath, between Bradshaw Brook and the 'Three Greyhounds.' Perhaps the same plant as Professor Babington's *R. villicaulis*, *β. derasus*, and Genevier's *R. adsitus*.

27. *R. festivus*, Wirt.—(2.) Prevalent about Tabley Hill, Knutsford racecourse, especially near Tabley toll-gate and Bexton; all along Tabley Lane. (7.) Near Bradshaw Brook, laneside, which joins Rudheath Road; apparently rare in this hundred, though very common in 2.

28. *R. Balfourianus*, Blox.—I believe thinly, but generally distributed in this neighbourhood, but easily overlooked. (2.) Turnpike roadside, at intervals, from the Ewe-tree, Tabley, to Mere,—this part of the road marked as Tabley Street; again, some enormous panicles from a bush or two growing in company with the *R. fuscus*, in Plumbley (to which refer), on Smoker Hill Farm. Abundant along the southern side of the Smoker wood, the only station I have yet seen it growing in any quantity.

29. *R. corylifolius*, Sm., *γ. purpureus*, Bab.—Not by any means a prevalent hedge *Rubus* in Cheshire. *R. diversifolius* occurs nine times to its once. Still it is generally but sparsely distributed. I am not certain whether I have ever seen *α. sublustris*, Lees, in Cheshire, except once at Biley, near Middlewich. (1.) Between Stockport and Mottram. (2.) Tabley Hill Lane; Clay House Farm. (4.) A field pit, near the river, about half a mile on the new ferry-side of Bromborough Pools, joining the Mersey. I believe this was var. *sublustris*, but am not sure. (7.) Biley (var. *sublustris*, Lees), New Covert, Lower Peover (*γ. purpureus*).

30. *R. althæifolius*, Host.—(4.) Plentifully by the road ide leaving Parkgate for the village of Neston. This plant seems to me quite identical with the prevalent Sussex *althæifolius*, which I studied this year in great plenty from Hove to Worthing. Mr. Robinson also finds the plant at Frodsham, in Cheshire, so likely enough it is a common form of littoral Cheshire. I named a specimen for that gentleman a few years back, which he had sent to the London Exchange Club, *R. corylifolius*, *β. conjungens*, as I believe Mr. Borrer so named the Hove plant. I now confess, that as far as *althæifolius* means anything, I believe both the Cheshire and Sussex plants exactly fit the name; but Mr. Bloxam says, "I rather consider your Hove plant as a variety of *R. corylifolius*."

31. *R. cæsius*, L.—Rare in Cheshire. (7.) The roadside at Biley Brows, near Middlewich; the only spot in Cheshire which, beyond doubt, I have seen it in. I have a specimen of apparently a weak cæsian form from the sandhills at Parkgate, but I am not convinced that it is, beyond contest, *R. cæsius*, so I will leave district 4 blank,—the weaker forms of *R. cæsius* and the "*dumetorum*" group being at times so difficult to distinguish. My record of *R. cæsius* in the 'Liverpool Flora' must, till I can again get upon our sandhills, be read with this qualification.

CORRESPONDENCE.

On Vernacular Names.

The perusal of Dr. Seemann's article on 'Vernacular Names' in the last number of the Journal, will doubtless direct attention to a much-neglected subject, though, unfortunately, I was the peg on which the remarks were hung. At the outset, however, a word of explanation is required. In quoting from his preface to the 'Nomenclature of the American Flora,' I did not wish to be understood (and I am sorry if, inadvertently, I conveyed the impression) that Dr. Seemann deemed vernacular names the 'end of inquiry,'—my sole object being to show that they *were* of great value, and to none more so than to the economic botanist. From the full quotation given by Dr. Seemann, it will be seen that he is of the same opinion.

With regard to the term 'Nag-kassar,' it affords to my mind an illustration of the care that should be taken in dealing with existing native names. In various works I found the name always quoted as that of the trees mentioned (*Mesua ferrea*, *Calysaccion longifolium*, etc.), and *not* as a dye obtained from several

plants. However, it is often the case that names are stated to be those of trees, whereas they may be only those of the products common to several.

Though I value vernacular names most highly, and do not *depreciate* them as I am charged with doing, yet it must be remembered that very different opinions have been expressed respecting them.

Dr. Wight says, "We must bear in mind that in India, as in England, the same plants have different names in different provinces, and not unfrequently the same name is given to a variety of plants, or, *vice versâ*, a great variety of names to the same plant, rendering the knowledge of very difficult acquisition, and, when acquired, of comparatively little value. Added to these impediments to the acquisition of a correct knowledge of vernacular names of plants, we know that these names, being preserved, not by description and figures, which limit them invariably to the same species, but by tradition, are therefore in the course of time, through mistakes of persons repeating them, liable to change by being applied to plants different from those to which they were originally given,—the only way, indeed, to account for the wide discrepancies often found in the names given to the same plants by different persons speaking the same language." ('Illustrations of Indian Botany,' vol. i., Introd. Notice, p. ii.)

And again, Surgeon-Major Balfour has the following:—"I may mention that care is required against placing undue reliance on native terms. It is a very prevalent, though erroneous impression that uneducated, and even wild, races possess accurate knowledge of natural objects, when in truth the whole of their thoughts through life are directed to procuring their own subsistence. In the preface to the 'Flora Andhrica,' Mr. Walter Elliott gives as authorities Drs. Royle and Griffiths in favour of, and Drs. Wight, Wallich, and Carey against, the use of vernacular names; yet he remarks that it is the commonest and most useful plants that are known by definite and generally-received appellations. Dr. Waring observes, in a recent number of the 'Madras Quarterly Journal,' that an entire dependence on native names, without reference to botanical characters or sensible properties, will often lead into error; and Dr. Hooker, in his 'Himalayan Journals,' mentions that throughout his travels he had been struck with the undue reliance placed on the native names for plants." ('Timber Trees of India,' Madras, 1862, preface.)

It should be added, however, that neither Dr. Wight nor Dr. Wallich possessed any accurate knowledge of the different Indian languages, which greatly weakens their opinion on this particular point. I cannot, however, resist the temptation of quoting from a letter (dated Batavia, Oct. 1854) by Mr. Motley to Mr. Mitten, bearing on the subject:—

"... These mountaineers, however, are botanists to an extent you would hardly expect among so-called savages. Every plant has its native name, and given upon the system of generic and specific names. For instance, when I asked a man the name of a little *Pavetta*, he said at once, "I never saw this before, and I don't know its own name, but its 'mother-name' is so-and-so," mentioning the native generic term for *Pavetta*, *Ixora*, and such plants in general. The authors of the 'Catalogue of the Buitenzorg Garden' have thought these

names worth recording, and I think they are right; for I saw many plants I should not have seen, especially among the *Ericæ*, but by asking for them by such names given in the Catalogue; and it is wonderful, on looking these over, to find how well the system is carried out. It is, of course, imperfect, but remarkable for people with no written language; they do not speak Malay or Javanese, but a peculiar dialect called Sundanese." (Kew Journ. Botany, vol. vii. 1855, p. 80.)

In a recent conversation, Motley's remarks as to the accuracy of vernacular names my friend Dr. J. E. de Vrij fully bore out, mentioning, at the same time, that in Java there was a collective name for the genus *Ficus* (Kiara), and the only error the natives made was in applying it to a species of *Quercus* (*Q. fagiformis*, Jungh. in Seemann's 'Bonplandia,' 1858, p. 83, cum icon.*), exceedingly Ficoidal in habit, and found by himself and Dr. Junghuhn.

Though native names are frequently the only clue we have to the origin of a product, yet at present there is much need for caution with regard to their use; traders, as a rule, applying them almost indiscriminately. Many plants, too, have distinctive names for the individual, and its different parts and product (*e. g. Cocos nucifera*, L.), these names being frequently quoted indifferently, thus giving rise to numerous mistakes. The change of country, of either native tribes or civilized immigrants, has a great influence on vernacular nomenclature, the names of the plants of their native country being bestowed on those of the new. Dr. Ernst, in his valuable paper on the "Medicinal Plants of Venezuela and their Vernacular Names" (Seemann's 'Journal of Botany,' Vol. III. p. 143), says, ". . . In Venezuela a plant often bears very different vernacular names. . . . The names I have collected are either of Indian or Spanish origin. At Caracas the Indian names are generally so corrupted that their original form could be traced only by a good Indian scholar, whilst in the interior, where the Spanish influence was less felt, many uncorrupted Indian names are still in use." He observes that the Spanish names are of three kinds, viz.—1, Names introduced with the plants from Europe; 2, Names of European plants transferred to American ones, which in habit or use bear some resemblance to them; and 3, Names newly invented, and not used for any plant before, seldom having an intelligible meaning.

Native names, at present, are scattered through innumerable publications, and a universal nomenclature would be an immense boon. To make such a work as complete as possible, it would be desirable that lists of plants, with their vernacular names, should be solicited from botanists of the localities with which they are best acquainted. These should specify, with regard to such names, localities where used, synonymy, if any, whether pure or introduced, derivation and meaning, whether applied as a collective or individual term, or to the parts or product of a plant. I shall be glad to receive any such lists, other than British.

Dr. Seemann has referred to my labours in economic botany. Whatever value, however, they may have, much of the credit belongs to him as editor of

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* This does not seem to be taken up by De Cand. (Prod. xvi.). Is it identical with *Castanopsis argentea*?—Ed.

this Journal. I should never have thought of publishing my maiden essay on "Caoutchouc," unless he had encouraged me to do so; whilst the kindly recognition with which it was received, decided me, in a great measure, in continuing to work up kindred subjects. In thus expressing myself, I know well that I do but echo the sentiments of many others who won their first spurs in the fair field opened to them in the pages of this Journal.

11, *Arthur Street, Deptford, S.E.* JAMES COLLINS.
November, 1869.

NEW PUBLICATIONS.

Flora of Middlesex: a Topographical and Historical Account of the Plants found in the County, with Sketches of its Physical Geography and Climate, and of the Progress of Middlesex Botany during the last Three Centuries. By H. TRIMEN, M.B., F.L.S., and W. T. DYER, M.A. London: Hardwicke. 1869. 8vo, pp. xli. and 428. With a map.

For a botanist who asks for variety of situation, or estimates the interest of his area of study by the abundance and number of rare plants which it furnishes, Middlesex does not by any means offer a promising field of research. As a botanical county, it is much inferior to Surrey or Kent. With the exception of Rutlandshire, it is the smallest county in England. Its total area is under three hundred square miles, of which at least a sixth is taken up by the houses and roads of London. In the remainder there is very little to diversify the character of the surface, for although, as we pass in a north-western direction the population becomes scanty many miles before the county limit is reached, there are no hills of any importance, and very little heath or woodland remains, and even in its original condition, the soil must have been very uniform in character. But, on other grounds, its botany possesses a special interest. A large proportion of the earlier investigators of English plants lived in London in the days when it was difficult and expensive to make distant journeys for collecting, so that many of the specimens which were used as the foundation for the figures and descriptions of the older books were gathered within its boundaries; and for no other tract in England have we such a multifarious collection of stations placed on record in print, or preserved in the older herbaria at the British Museum and in other places.

It is perhaps a matter of surprise, that during the many years which have elapsed since geographical botany put in a claim to be ranked as a distinct department of science, a detailed Flora of the county has not been before attempted; considering the interest which it possesses in showing, not only how the character of a flora is modified by human agency, but also as bearing upon the history of the gradual growth of London, and the history of British botany and British botanists. But it is easy to see that without a large amount of labour incurred in gathering together and arranging the old records, the work could not be adequately done. This the authors of the work before us have thoroughly understood, and they have been willing, in gathering them from all available sources, published and unpublished, and carefully sifting them, to spend an amount of pains and labour which certainly merits for them the thanks of all who are interested in English botany. A great part of the value of their work arises from the fact that they have been able to see so well that Middlesex botany possesses in this way a unique interest of its own, and that instead of merely following in the track of those who have written county Floras before them, they have not spared to spend the unusual amount of labour that was necessary to develope to the full the historical interest of the subject; and it makes their book, over and above its value as a record of stations and distribution, one that can be read with pleasure and instruction by those who take no special interest in botanical details.

The first part of the book is devoted to a sketch of the physical geography, geology, and climate of the county, and is illustrated by a coloured map, showing the area occupied by the different strata and the boundaries of the seven districts, founded on river-drainage, through which the dispersion of the species in the body of the work is traced. Along the northern border of the county the ground rises into a ridge that for several miles reaches a height of between four and five hundred feet above sea level. A similar ridge of equal height bounds London on the north at Highgate and Hampstead. Between the two is a depression, out of which rises only the isolated hill on which the village of Harrow stands. The south-western third of the county is a low flat, nowhere more than twenty feet above the Thames level at Staines. In the character of the soil, we get in the county two well-marked divisions, underlaid by beds differing but slightly in age but materially in

mechanical constitution. The ridge of chalk-down that forms the rim that encloses the tertiary strata of the London basin, stretching from Hampshire and Wiltshire, through Berkshire and Hertfordshire to Cambridgeshire, and the north-west of Essex, only just touches the extreme limit of Middlesex at two points. On the south of this, filling up rather more than the northern half of the county,—reaching down on the east, within the metropolitan limits, to Regent's Park and Holloway,—the London clay fills up the whole of the low levels, capped only with the barren sandy and gravelly beds of the Middle Eocene in a few places on the ridges, as at Harrow and Hampstead Heath. The greater part of this clay tract is covered with soil that is far too tenacious to be fit for arable cultivation. "In few counties," writes Mr. Clutterbuck (see p. xxv.), "is the meadow and arable land so nearly divided, or the extent so clearly defined; and though not without exceptions, the surface occupied by the London clay and the valley-drifts respectively, determines the extent under grass and under the plough. The part of the county in which the London clay is at or near the surface consists of gently rising hills, with small valleys gradually worn away by the surface drainage. In the farms, all operations are made subservient to haymaking for the London market." In the southern tract, which fills up rather less than half of the county, the surface beds are valley-drift (gravel, brick earth, and alluvium), and the soil is much more tractable and fertile. The eastern part of this tract is now nearly all built over. Passing westward to Chiswick, Hammersmith, Isleworth, and Brentford, what is not taken up by houses, roads, and parks, is almost all occupied by market gardens; and this leaves only on the west a tract of about ten miles across each way between Twickenham, Staines, and Uxbridge, in which corn is grown to any considerable extent. Our authors' sketch of the physical geography and climate of the county is very full and clear. The only point on which we have any fault to find is, that they have not understood clearly the relationship of the British to the European flora as influenced by climate. As this is an important point, and their misconception will very likely lead others astray, we will quote their paragraph on this subject, and interpolate a running criticism on the sentences.

"Plants which would not bear complete exposure to frost will often survive, with slight shelter, frosts of short duration; and near the western coasts, where the influence of the sea has greater effect, espe-

cially in mitigating the winter, comparatively tender plants flourish in the open air throughout the year. A warm winter is an essential condition for the existence of tender plants with *perennial* stems. (So far very good.) In the neighbourhood of London, on the other hand, the semi-spontaneous exotic plants which belong to the vegetation of climates with a higher mean temperature are necessarily annuals. (It does not follow from climatic causes that they should be annuals, so that this sentence placed in connection with the preceding one, conveys a wrong impression.) Many of them are more abundant in some years than in others, a warm spring being essential to allow them to reach maturity before the first frosts. Provided that the summer heat is sufficient to allow them to ripen their seeds, annuals are capable of a more extended northern duration than perennials. (Sentence very obscure.) With regard to perennials, the following remarks may be quoted from Mr. Baker:—"In general terms, the polar limit of species liable to be killed by frost runs across Europe from N.W. to S E. diagonally with the parallels of latitude; and to sum up in a single comprehensive phrase the relations of the British to the Continental flora, we may say that the north limits of the plants as regulated by temperature radiate from our island like the spokes of a wheel from the axis." (By restricting this comparison to perennials it is spoilt, and conveys quite a wrong impression. It is true only when applied to the British flora as a whole. It is *annuals* that furnish the ascending spokes of the wheel, the *evergreen perennials* the lowest descending spokes, the *biennials* and *deciduous-leaved perennials* the intermediate ones.) P. xxxix.

Upwards of three hundred closely printed pages are occupied by the list of species, with a detailed account of their dispersion through the seven drainage districts. A full list of special stations is given for all but the common ones, and especial pains is taken under this head with the flora, present and past, of the metropolitan tract. Under each species are given any old names under which it has been recorded, as a Middlesex plant, and the date of the first notice of its occurrence. Of the care with which the history of the species is traced, and with which the records of their occurrence have been gathered together, we shall best give an idea by an extract.

48. Sisymbrium Irio, *L.* *London Rocket.*

Irio læris apula, Col. (Merrett). *Erysimum latifolium Neapolitanum*, *Park.* (Ray). *Erysimum latifolium majus glabrum*, *C. B. P.* (Morison). Cyb. Brit. i. 150; iii. 384; Comp. 102. Curt. F. L. f. 5 (drawn from a London plant).

On walls and dry waste ground, very rare. A. or B. July, August.

VII. Almost everywhere in the suburbs of London, *Merrett*, 66. Especially on earth mounds between the City and Kensington; in 1667 and 1668, after the City was burnt, it grew very abundantly on the ruins round St. Paul's, *R. Cat.* i. 104. Copiously about Chelsea, *Morison*, ii. 219; where, and also in the 'Præludia' of the same author, p. 498, is an interesting account of the growth of the species after the great fire. Plentifully on the Lord Cheney's wall at Chelsea, *Pet. Midd.* Between Brick Lane and Islington, *Pet. Bot. Lond.* 291. At the end of Goswell Street, *Hill*, 338. Frequent enough about London, *Curt. F. L.* In Chelsea garden and all that neighbourhood a troublesome weed, *E. B.* 1631. Brompton, Mr. Borrer; about Haggerstone and near Chelsea, E. Forster; opposite Shoreditch Workhouse, L. W. Dillwyn; *B. G.* 408. Growing in 1832 beneath brick walls by the side of a then new road leading from Earl's Court to the new church near Walham Green, which road passes the north boundary of the Cemetery, not very plentifully. . . . Mr. Haworth told me that when he first came to live at Chelsea, about 1790–95, it used to grow in great abundance in various places by the roadside between Little Chelsea and Hyde Park Corner, *Pamplin* (*v. s.*). See also *New B. G.* 97.

First record, *Merrett*, before 1666; also the first record as British. We have seen no specimens collected since 1832, nor ever met with it ourselves, though no doubt it was formerly very abundant, as the above localities are confirmed by specimens in all the older herbaria collected near London. [P. 33.]

The total number of native and naturalized species claimed by our authors for the county is 859, out of which 58 are supposed to be now extinct, and 133 are very rare. Besides these, they mention 120 casual introductions and garden escapes. Adapting the species limits to those employed by Mr. Watson in 'Cybele Britannica,' and comparing the county list with that for Britain as a whole, we obtain the following results, and we give also the North Yorkshire table for comparison:—

Type of Distribution.	Britain.	North Yorkshire.	Middlesex.
British	532	526	465
English	409	301	300
Intermediate	37	33	4
Scottish	81	44	5
Highland	120	32	0
Germanic	127	38	44
Atlantic	70	7	3
Local or Doubtful	49	11	5
	1425	992	826

The deficiency in the upper line of numbers, it must be borne in mind, is caused by the absence from Middlesex of a large number of characteristically maritime species. From the 826, the 58 species require to be deducted to represent the flora as it now stands. No doubt the county list is far more likely to be lessened than increased in the future.

The remainder of the work is occupied by a series of interesting biographical notices of the older botanists who have contributed to the knowledge of the flora of the county. This is derived to a considerable extent from unpublished material, the Sloane manuscripts in the British Museum being the principal source of fresh information. Mr. Worthington Smith has contributed a list of the Hymenomycetous Fungi of the county; the Rev. J. M. Crombie a notice of its Lichens; and Dr. Braithwaite and the Rev. W. M. Hind, a list of Mosses and Hepaticæ.

Compendium of the 'Cybele Britannica;' or, British Plants in their Geographical Relations. By HEWETT COTTRELL WATSON. Part II. Thames Ditton. Printed for private distribution. 1869. (Pp. 201–424.)

It is just a year since we noticed ('Journal of Botany,' Vol. VI. 374–377) at some length the first part of this excellent and useful book. Mr. Watson has carried out the intention he expressed in the preface to that part, and has not allowed 1869 to pass away without completing his 'Compendium' so far as the native species are concerned.

In this second part, 880 species are treated in accordance with the formula of eight lines, which we explained in our notice of Part I. The amount of information comprised in each of these formulæ is really amazing, and each affords an excellent example of what may be effected by a judicious system of condensation and abbreviation.

It is quite unnecessary to recommend a book which must take its place as essential to the library of every British botanist. In a work of such extent there must be, of course, many points upon which any two individuals will hold different opinions; but, after all, the book is mainly a record of facts, and it is on this account that it is of so great value, and lays all students of our native flora under obligation to its author. On p. 348, in the list of counties for *Wolffia arrhiza*, "Hants" is erroneously entered for Kent.

There is yet a third Part to be expected, treating of the segregate species, and the "aliens" and "casuals." We trust Mr. Watson will have health and leisure to complete it.

BOTANICAL NEWS.

Professor Behn, of Hamburg, has been elected, by the majority of the Council of President Adjuncts, President of the Imperial German Academy Naturæ Curiosorum, and has accepted the office.

Mr. Kurz, of Calcutta, sends us a reprint of his 'Supplementary Remarks' to his 'Revision of Indian Screw-pines' (Seem. Journ. Bot. Vol. V. p. 93), which he has published in the Journal of the Asiatic Society of Bengal, and we also receive a translation of this, made by Dr. Hasskarl, and recently published in the Ratisbon Flora. Mr. Kurz does not seem to have noticed the remarks on Sandwich Island *Pandaneæ*, made by the late Horace Mann in his 'Enumeration of Hawaiian Plants' (Proceedings of American Academy). The following errors and omissions, which crept into his paper in our Journal, are thus corrected:—*Typha elephantina*, p. 95, *read* folia . . . . basi triquetra, lateribus concavis, supra plana; *instead of* "excavato-trigona." II. *Pandaneæ*, p. 94, *add* Ovarium superum. III. *Cyclantheæ*, p. 94, *add* Ovarium inferum. The *Freycinetieæ* are to be transferred to II. *Pandaneæ*. *Pandanus furcatus*, var. *Indica*, p. 102, *read* drupæ valde convexæ, *for* "concavæ." *Pandanus lævis*, p. 127, *read* spadix masc., etc., sed hæ lævissimæ, *instead of* "brevissimæ."

Mr. Kurz has also printed in the Journal of the Asiatic Society of Bengal a paper on *Pandanophyllum* and allied genera, among them *Scirpodendron*, the most gigantic of all *Cyperaceæ*, the leaves being 6-9 feet long.

Professor Alexander Braun has recently read before the Berlin Academy papers on *Isoetes Kirki*, of New Zealand, a malformation of *Podocarpus Chinensis*, and some Oaks struck by lightning which, as well as all that proceeds from the pen of that thoughtful and conscientious botanist, will be studied with interest and profit.

The last published part of De Candolle's 'Prodromus' contains the following Natural Orders:—*Daphniphyllaceæ* and *Buxaceæ*, by Müller Arg.; *Empetreæ* and *Cannabineæ*, by Alph. de Candolle; *Urticeæ*, by Weddell; *Piperaceæ*, by Casim. de Candolle; *Chloranthaceæ*, by Solms; and *Garryaceæ*, by Alph. de Candolle. The next part is to complete this great work, but we hope and trust that the editor may be induced to reconsider his resolve, and not exclude the Monocotyledons, as he now means to do. Indeed, the extension of the 'Prodromus' is of such vital importance, that all our academies and natural history societies ought to assist, by all means in their power, even largely, pecuniarily, if it should be required, to promote it.

Professor Oliver has published a most acceptable handbook, entitled, 'First Book of Indian Botany' (Macmillan and Co)., an adaptation of the author's 'Lessons in Elementary Botany,' for use in India.

We have to record the appearance of two new periodicals devoted to popular science, 'The Academy,' published by Murray, and 'Nature,' published by Macmillan.

The Queen has been graciously pleased to give orders for the appointment of Joseph Dalton Hooker, Esq., M.D., Director of the Royal Botanical Gardens at Kew, to be an Ordinary Member of the Civil Division of the Third Class, or Companions of the Most Honourable Order of the Bath.

The following inscription to the memory of the late Professor Daubeny has been placed in the chapel of Magdalen College, Oxford :—

XP.
AD · GLORIAM · DEI
ET · IN · MEMORIAM
CAROLI · ÆGIDII · BRIDLE · DAVBENY · M · D
ANNOS · LI · HVIVSCE · COLL · SOCII
LITERARVM · HVMANIORVM · EXIMIE · DOCTVS
CHEMIÆ · BOTANIÆ · GEOLOGIÆ
SCIENTIA · INSIGNIS
AMICIS · AMICISSIMVS
TAM · ACADEMIÆ · QVAM · COLLEGIO · DEVINCTVS
DEVM · TOTA · MENTE · COLVIT
IN · CHRISTO · OBDORMIVIT
DIE · MENSIS · DECEMBRIS · XIII
A · S · MDCCCLXVII
ÆTATIS · LXXIII
AVE · ANIMA · SIMPLEX · PIA · DESIDERATISSIMA.

Mr. J. Collins, the zealous Curator of the Museum of the Pharmaceutical Society, has been made a member of the Natural History Society of Caracas.

The fourth part of Mr. J. W. N. Key's 'Flora of Devon and Cornwall' has just been published. It carries on the enumeration to the end of *Scrophularineæ.*

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